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FINAL ENVIRONMENTAL IMPACT STATEMENT

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PERMIT APPLICATION BY UNITED STATES STEEL CORP. PROPOSED LAKE FRONT STEEL MILL, CONNEAUT, OHIO.

⑩ Paul G. /Leuchner
Gregory P. /Keppel

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A detailed analysis of the primary and secondary environmental impacts associated with the construction and operation of a new steel mill. The proposed facility will occupy a 2,760 acre site on the south shore of Lake Erie between Conneaut, Ohio and West Springfield, Pennsylvania. During full scale operations the plant will employ 8,457 and produce about 7.5 million tons of steel annually.

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SUMMARY

PROPOSED LAKEFRONT STEEL MILL
CONNEAUT, OHIO

( ) DRAFT (X) FINAL ENVIRONMENTAL IMPACT STATEMENT

RESPONSIBLE OFFICE: U. S. Army Engineer District, Buffalo,
1776 Niagara Street, Buffalo, NY 14207
Telephone No. (716) 876-5454

1. NAME OF ACTION: (X) Administrative ( ) Legislative

2. DESCRIPTION OF ACTION: This Final Environmental Impact Statement was prepared by the U. S. Army Corps of Engineers, as the lead Federal agency, to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA).

The proposed action involves a request by the United States Steel Corporation, 600 Grant Street, Pittsburgh, PA 15230 for a Department of the Army permit to perform certain work in Lake Erie and its tributaries. Activities proposed by the applicant include the construction of a water intake and discharge system in Lake Erie; extension of the Conneaut Harbor east pier, construction of an adjoining unloading dock, and installation of a shore connected raw materials handling system; dredging lakeward of the unloading dock; and the culverting of Turkey Creek between State Line Road and a point 1,500 feet upstream of Lake Erie. Changes in the project description since the release of the draft statement, include modification of the pier extension and unloading dock to improve water circulation and elimination of the proposal to fill and divert Turkey Creek. The applicant has also developed a fish and wildlife management plan for selected portions of the Lakefront plant site.

The activities covered in this Department of the Army permit application are part of an overall plan by the U. S. Steel Corporation to construct an iron and steel manufacturing complex near Conneaut, OH. Specifically, the proposed Lakefront plant will be constructed on a 2,760-acre site adjoining Lake Erie between Conneaut, OH, and West Springfield, PA. Construction and operation of the proposed mill would take place in two separate steps. Step I activities would begin during the first quarter of 1979 and terminate in the third quarter of 1982. During this period onsite construction employment would gradually rise reaching a peak of 10,500 by the second quarter of 1981. Operations employment for Step I is projected to reach a peak of 5,381 in 1982 and remain constant thereafter. At the conclusion of this phase of development, the proposed Lakefront plant would

be capable of producing 3.75 million tons of steel on an annual basis. Approximately 18 months after Step I is completed, Step II would begin with completion of these activities expected by the third quarter of 1987. Construction employment during this phase will peak at 6,600 during the first quarter of 1986 then gradually taper off. Operations employment is expected to rise for this phase to a combined maximum of 8,457 in 1987 and remain constant thereafter. At the conclusion of Step II the proposed Lakefront plant is expected to produce 7.5 million tons of steel annually.

The construction and operation schedules presented in this Final Environmental Impact Statement are predicated on the assumption that site preparation work would begin during the first quarter of 1979. The reviewer is cautioned that this is a hypothetical date which has been established solely for the purpose of predicting plant related impacts over the short and long-term. In actuality, construction of the proposed Lakefront steel plant will not commence until such time as all of the necessary Federal, State, and local regulatory permits have been secured and the applicant has determined that sufficient capital is available to proceed with the action.

In addition to the work requiring a Department of the Army permit, the following plant support and process facilities would be constructed by the applicant: raw materials handling and storage area, four coke oven batteries, coal chemical plant and by-products recovery system, lime plant, sinter plant, two blast furnaces, three Q-BOP furnaces for oxygen steelmaking, a slag processing facility, continuous casting plant, hot strip rolling mill, plate mill, and a scrap handling facility. Other onsite ancillary or support systems include offices, laboratories, emergency medical and fire protection services, warehouses, service shops, parking lots, food service facilities, access roads, fuel storage areas, a power station and transmission system, a water distribution system, and an air separation plant. The facility as proposed would not have any cold-rolling or cold-finishing capability.

Atmospheric emissions associated with individual plant process units would be controlled in accordance with U. S. Environmental Protection Agency Best Available Control Technology (BACT) requirements and Lowest Achievable Emission Rate (LAER) limitations, as appropriate. Individual process units having a wastewater discharge would be equipped with their own treatment facilities as required. All treated process water streams, cooling tower blowdown, miscellaneous service water, roof runoff, and treated sanitary wastewater would be combined into a single wastewater stream and discharged to Lake Erie via a multiport diffuser located 5,300 feet offshore. Solid wastes generated during plant operations would be recycled to the maximum extent possible. All other solid waste materials (some of which may

be classified as hazardous) would be deposited at designated locations on the Lakefront site if no suitable offsite landfills are available. Iron ore pellets and limestone would be delivered to the proposed plant by lake vessels using Conneaut Harbor, while coal shipments would be received by rail. Annual raw material consumption during capacity production is expected to be 7.8 million tons of iron ore pellets, 2.8 million tons of iron ore, 1.4 million tons of limestone, approximately 6.0 million tons of coal and oil, and an average of 440,000 tons of various types of fuel. Hot-rolled mill product would be shipped from the proposed plant by truck or rail to existing U. S. Steel Corporation facilities for further processing or to customers within the Great Lakes Basin market area.

3. (A) ENVIRONMENTAL IMPACTS: The primary and secondary impacts of the facility on the human and natural environment are summarized below:

Primary Facility Related Impacts

(1) The proposed Lakefront plant would produce 4.9 million tons of hot-rolled sheets and coils and 1.52 million tons of steel plate which would aid the U. S. Steel Corporation in maintaining its share of the projected increase in these markets.

(2) The proposed Lakefront plant represents an application of steelmaking technology heretofore not attempted in the United States. Although each process unit of the proposed plant has been utilized in various facilities, no domestic company has integrated the process units to the extent proposed. The resultant plant would demonstrate a new level of productivity in the United States steelmaking industry.

(3) Construction of the proposed steel mill would involve approximately 1,766 (primary impact area) of the 2,760 acres comprising the Lakefront site. A substantial portion of this acreage would be cleared and graded to allow for the construction of roads, buildings, and other ancillary facilities. Uncommitted areas that are cleared during the construction phase would be converted to grassland or covered with slag. The remaining land outside the primary impact area, but within the fenced perimeter of the Lakefront site would consist of a 507 acre "greenbelt" area adjacent to Turkey Creek and upstream of the proposed culvert and a 487 acre tract of land near Elmwood Road. Neither area is slated for development at this time.

(4) Erosion rates on the Lakefront site are estimated at 10-20 tons per acre per year during the construction phase. The magnitude of erosion impacts on water resources adjacent to the plant site

would be dependent on the success of an onsite erosion control program to be developed by the applicant.

(5) Lined impoundments would be used for fine grained solid wastes generated by the proposed plant. Disposal areas for bulky materials and spent refractories would not be lined since the potential for contaminated leachate generation is limited. However, a suitable lining material will be used if final design tests show that the soils have a permeability greater than 10^{-7} cm/sec. Groundwater contamination is considered to be minimal for all onsite disposal areas.

(6) Ambient air quality standards would not be violated at the site during the construction phase.

(7) The long-term calculated increment of sulfur dioxide added by the proposed Lakefront plant is expected to be 5 ug/m^3. This addition would not deviate from the criteria defined in the PSD regulations and would not violate the annual average standard. A statistical analysis of the results of the onsite air quality monitoring program indicates that the short-term PSD increment and secondary standard for particulates would be met. Similarly, operation of the proposed plant is not expected to violate the ambient standard for sulfur dioxide. Projected sulfate concentrations downwind of the proposed plant may increase from 1 to 7 ug/m^3 on a 24-hour average compared with background concentrations of 19 and 35 ug/m^3. Such meteorological conditions are expected to occur in the vicinity of the Lakefront site with a frequency of once in three years. Ambient air quality standards for the other criteria pollutants would not be exceeded.

(8) The distribution of forced draft cooling towers throughout the developed portion of the Lakefront site would diminish the likelihood for ground fog formation, icing, and mineral salt deposition that is normally associated with the operation of a single large cooling tower.

(9) Noise associated with the construction and operation of the proposed plant would have a negligible effect on ambient levels beyond the site boundary.

(10) Stormwater runoff from developed portions of the site would be impounded and treated as required prior to release. Runoff from undeveloped portions of the site would not be collected or treated.

(11) Development of a steel manufacturing facility on the Lakefront Site would require the installation of a culvert in the lower reach of Turkey Creek and the filling of several intermittent onsite tributaries and small ponds.

(12) Contaminants remaining in the discharge stream after treatment would be discharged into Lake Erie in concentrations higher than normally present in this waterbody. The applicant now intends to use equalization lagoons at the proposed Lakefront site to improve the quality of the effluent and to dissipate the heat generated during plant operations.

(13) Construction materials such as steel, concrete, nonrecyclable minerals, and metals would be irreversibly committed if the proposed plant is built.

Secondary Facility Related Impacts

(1) In the combined Ohio-Pennsylvania Regional Study Area the proposed Lakefront plant is expected to generate $20 million (1975 dollars) annually in purchases during the construction phase and $55 million annually during the operation phase.

(2) The proposed Lakefront plant would directly and indirectly generate employment opportunities within the Regional Study Area and Principal and Local Areas which comprise it. Plant-related direct, indirect, and induced employment in the Regional Study Area is expected to increase steadily from 1979 until a peak of 16,800 jobs is reached in 1986. Between 1986 and 1990 the number of these positions would decrease gradually, eventually stabilizing in 1990 at about 13,400. Within the Ohio Local Study Area (Conneaut) combined direct, indirect, and plant-induced employment would reach a peak of about 6,035 jobs in the 1986 then decline to a stable level of 4,265 positions in 1990. Plant-related employment in the Pennsylvania Local Study Area (Springfield and East Springfield Borough) would reach a peak of 7,965 jobs in 1986 levelling off to about 6,485 in 1990.

(3) Total plant-related payrolls (1975 dollars) generated in the Regional Study Area are expected to amount to approximately $33 million in 1979, $218 million in 1981, $248 million in 1986, and $185 million in 1990. Plant-related payrolls in the Ohio Local Study Area are expected to amount to $10 million in 1979, $82 million in 1981, $92 million in 1986, and $58 million in 1990. Payrolls in the Pennsylvania Local Study Area would amount to $18 million in 1979, $114 million in 1981, $129 million in 1986, and $103 million in 1990.

(4) The anticipated product mix and geographic location of the proposed plant is such that general relocation of steel consuming industries to the Regional Study area is not expected. However, industries requiring the consumption of large quantities of raw steel, such as shipbuilding and railroad car manufacturers, may be attracted to the area after Step II plate production operations

become well established. Other small firms, principally those involved in equipment repair or the warehousing of replacement parts, could relocate to the Study Area.

(5) The applicant predicts that the greatest overall population impact is expected to occur in 1990 when approximately 15,800 new residents would be living within the limits of the Regional Study Area. About 5,265 of these new residents are expected to reside in the Ohio Local Study Area, while the total increases projected for the Pennsylvania Local Study Area is approximately 2,830. However, other population growth scenarios exist that reasonably project population increases in the range of 11,000 to 58,500 new residents. Local governmental officials and planning specialists are encouraged to review all such scenarios before planning for the future needs associated with the construction and operation of the proposed Lakefront plant.

(6) The peak plant-related need for housing in the combined Ohio-Pennsylvania Principal Study Area would occur in 1982 when 1,605 housing units are projected to be needed and again in 1987 when 1,035 units would be required. Housing shortages may occur in the Local Study Area due to construction lead time for new homes, lack of adequate infrastructure, and the low turnover rate for existing homes.

(7) During the construction and operation of the proposed Lakefront enrollments in the public school systems of the Local and Principal Study Areas would moderately increase. Collectively, these school districts would experience a maximum enrollment increase of 15 percent over declining baseline projections during the period 1979 through 1990. However, by 1990 total baseline and plant-related enrollments are projected to be 25,450 students which is less than the 1975 total of 28,000. Both the Conneaut Area City schools and the Northwestern School District would experience a substantial influx of new pupils as a result of the proposed project. The Conneaut Senior High School would not have sufficient capacity to accommodate operations-related student increases until the mid 1980's. In the Northwestern School District, adequate capacity can be maintained until 1987 when the West Springfield Elementary School is closed. Other school districts within the Principal Study Area appear to have sufficient capacity to handle any plant-related increases in enrollment.

(8) Development of the proposed Lakefront facility is expected to increase consumer prices somewhat faster than would otherwise occur under baseline conditions. The principal component of consumer prices likely to be most affected by the plant and related development would be housing. As large numbers of inmigrants enter the area during 1981-1982 and 1986-1987, there is likely to be a short-term

lag in providing sufficient housing, particularly in the Conneaut area. Therefore, competition for existing and new homes would increase, possibly driving prices up. Increased wages and demand for apartments may cause an escalation in monthly rentals. Other components of the cost of living such as clothing and medical expenses may increase slightly faster as a result of the overall higher wage among plant workers. The increased cost of living would have a significant impact on those with fixed or low incomes.

(9) The existing health care system in the Coastal Communities of the Principal Study Area would be altered to some extent by the proposed action. To meet the health needs of the new population without compromising the existing level of health care services in Ashtabula County, more inpatient beds would be required. Brown Memorial Hospital in Conneaut will probably experience the largest impact since projections indicate that this 86-bed facility may have to expand to 105 beds by 1982 and 120 beds by 1987. Ashtabula General Hospital may need to expand from the current 235 beds to 265 beds by 1987. Other hospitals in the Principal and Regional Study Area should not be affected by the proposed plant. Additional physicians would also be required as hospital facilities expand. Approximately 10 physicians would be needed at Brown Hospital by 1990 while 12 physicians would be required at Ashtabula General.

(10) Those communities within the Principal Study Area that are served by their own police departments would experience small incremental increases in employment and expenditures over baseline levels if the proposed plant were built. However, establishment of a local police department in communities currently protected by the County Sheriff or State Police would be costly. Assuming the projected baseline police department organization prevails, nine additional police officers would be required in Conneaut by 1990, while five would be needed in Springfield. Overall the remaining Coastal Communities would require five additional officers. Other manpower requirements include four additional deputies for the Ashtabula Sheriff's Department and two officers for the Pennsylvania State Police Substation in Girard. New facility construction would be required in Conneaut and Springfield whereas the facilities in the other Coastal Communities appear adequate to meet the needs associated with an increase in staff.

(11) Plant-related impacts on fire protection services would occur in Conneaut, OH, where fairly large increases in employment in Ashtabula Township, Ashtabula City, and Saybrook Township, but to a much lesser extent. Volunteer fire department costs in the Pennsylvania Coastal Communities are projected to rise somewhat if the proposed Lakefront plant is built.

(12) Collectively, the attraction of large number of unemployed workers to the area, possible rapid increases in the cost of living,

and short-term unemployment among construction workers would increase total and per capita social services costs. Since heads of households in the new resident population are expected to have relatively high-paying jobs at the proposed plant, none of these families are expected to require financial assistance. Plant-related development is also expected to provide job opportunities for individuals within the Regional Study Area that are already receiving financial support under some public assistance programs. If the two latter factors prevail, it is possible that overall social service requirements in the area may be reduced as a result of the proposed project.

(13) For most of the Coastal Communities in the Principal Study Area the scope of general governmental services is expected to remain the same except for some increase in employment and expenditures to serve the plant-related increase in population. Requirements for additional government employment are projected to be highest for municipalities in the Local Study Area. By 1990 Conneaut would require about six additional full-time equivalent employees while in Springfield one full-time equivalent employee would be needed. Floor space requirements to accommodate additional employees would be minimal and should not require construction of new buildings. However, some modifications of existing facilities may be needed to provide the required amount of office space.

(14) Local governments and school districts in the Local Study Area would receive substantial financial benefits as a result of the construction and operation of the proposed Lakefront facility. In 1986 the Conneaut property tax rate could decline to an estimated rate of $0.20 per thousand of assessed valuation. This rate reduction would occur as a result of the Lakefront facility addition of $107 million of assessed valuation to the city of Conneaut property tax base and the projected receipt of $727,000 in income tax revenues from Lakefront facility employees. Springfield Township could eliminate its property tax ($2.20 per thousand of assessed valuation) since the income taxes paid by Lakefront plant employees alone would exceed its expenditure requirements. The largest tax rate reduction in any taxing jurisdiction in the Local Study Area could occur in the Coastal Area City School District. A substantial reduction in property tax rates may also be incurred in the Northwestern School District as the valuation of the Lakefront Plant is added to the tax base.

In general, plant-related development is expected to have little effect on the tax rates of municipalities in the Principal Study Area. However, tax rate increases may occur in certain school districts. For example, the largest projected tax rate increase would occur in the Buckeye School District where a $2.40 tax rate

increase would be needed to meet plant-related expenditure requirements in 1990. Both Ashtabula and Erie Counties could reduce their property tax rates as a result of the proposed Lakefront Plant but not nearly as much as the Local Study Area municipalities and school districts. Ohio and Pennsylvania State tax revenues generated by the proposed Lakefront plant would be small by comparison.

(15) Specific changes in drainage facilities would be anticipated as concentrated commercial and residential development occurs. In Conneaut, plant-induced growth would require continual storm drainage improvements through 1990 with the total cost estimated at $200,000. Similar improvements would be needed in Springfield over the same period of time which are projected to cost as much as $110,000. The cost of storm sewers needed to service new developments would be borne by the contractor while subsequent maintenance would largely be the responsibility of local government.

(16) By 1990 the solid waste generated as a result of plant-related secondary growth and development would increase the total area required for disposal by about five acres. No changes in the systems or equipment required to collect solid waste are anticipated nor are any cost increases expected as a result of the proposed development.

(17) The impact of the proposed development on central water supply systems in the Principal Study Area are largely financial with capital investments and increased operating costs probably financed through increases in water usage rates. Maximum increases in average water rates induced by the plant-related secondary development are expected in the boroughs of Lake City and Girard where a five percent rise would be incurred. Springfield Township and East Springfield Borough could require a central water supply system earlier (by 1982) than would be expected under baseline conditions to serve the plant-induced increase in population. Development of such a system could require the investment of more than one million dollars by 1982 and resultant water usage rates would be higher than those already in effect in the Principal Study Area.

(18) In the Ohio Principal Study Area total electricity consumption associated with plant-related secondary development is expected to reach a maximum of 61 million kWh in 1990 while in the Pennsylvania Principal Study Area peak usage of 42 million kWh is anticipated during 1986. Natural gas consumption in the Ohio Principal Study Area would reach a maximum of 520 million cubic feet in 1990 while in Pennsylvania plant-related gas usage would peak at 400 million cubic feet by 1986. Total consumption of distillate oil by plant-induced secondary development is estimated to reach a maximum of 26,000 barrels in 1990.

(19) Development associated with the construction and operation of the proposed Lakefront plant would cause increases in the sewered population and sewage flows. The addition of 4,750 individuals to the sewered population of Conneaut by 1990 would increase sewage flows by about 0.7 MGD. Under these circumstances expansion of the existing sewage treatment plant could be required at an estimated cost of about $1.1 million. The plant may not have to be expanded if existing stormwater inflow and infiltration problems are solved. Construction of laterals and extension of some interceptors may be required at the cost of about $600,000. Projected 1990 increases in the population of Springfield may not occur unless sewers are installed since soil conditions are not suitable for onlot disposal of sewage wastes. The need for sewage facilities is expected to become critical by 1982. If Springfield joins the Authority, plant-induced development would increase the sewered population in the Northwest Erie County Sewer Authority by approximately 6,100 individuals, raising sewage flows by 0.8 MGD. If the new treatment facility proposed for this area does not include the plant-related population as a part of its design capacity then future expansion would be required along with the installation of additional interceptors. The total cost of such an expansion is estimated at about $7.1 million. By 1990 the sewered population of the Ashtabula City Treatment Plant is projected to increase by 3,900. Although the plant has sufficient capacity to treat the added sewage flow, operating costs are projected to increase by about $100,000 per year. In the Erie City Service Area, the sewered population would increase by 1,000. The resultant expansion of interceptors required to meet the needs of the added population is expected to cost approximately $350,000 while plant operating costs are projected to increase by $20,000. Based on information obtained on treatment plants in Conneaut City, Northwest Erie County, Ashtabula City, and Erie City and the degree of plant-induced development BOD and phosphorous loading to area waters is expected to increase by 2.1 to 3.7 percent.

(20) Construction and operation of the proposed Lakefront plant would affect land use within the Ohio-Pennsylvania Local Study Area. The plant-induced influx of new residents would increase the rate of urbanization and suburbanization in Conneaut, while in Springfield accelerated rural residential expansion would be most typical. An increased quantity of land would be converted to recreational use as the demand on existing facilities within the Local Study Area rises with population. No significant changes in the proportionate distribution of land use types are expected although usage within certain categories would be more intensive. For the Ohio Regional Study Area accelerated growth in residential land use is anticipated with Kingsville and Ashtabula experiencing the greatest degree of suburbanization. Growth in Ashtabula City is expected to offset the negative growth trend projected for this area under baseline conditions.

Accelerated growth in residential land use is expected to be minimal over the entire area with little change in overall regional land use distribution. The communities of Millcreek, Fairview, and Girard may experience a slight acceleration in suburbanization. Plant-related growth would be expected to progress from Springfield toward Millcreek.

(21) Plant-induced development in the Ohio Local Study Area during the construction phase would not significantly increase demand on existing recreational facilities. Beginning with the start up of plant operations in 1981 utilization of recreational areas would rise. By 1990, approximately 5,300 operations-related new residents would occupy the area placing increased pressure on public atheletic fields, beaches, picnic areas, private recreational facilities, and available land for hunting and fishing. Increased usage of existing public and private boat launching facilities would tend to aggravate the already overcrowded conditions experienced during the boating season. In the Pennsylvania Local Study Area, demand on recreational facilities during the construction phase would be relatively low compared to usage by the related population during the operations phase. Since small boat launching areas and beaches are inadequate to meet present demand, overcrowding can be expected to continue. Recreational facilities in the Ohio and Pennsylvania Coastal Communities would experience varying degrees of usage during the plant construction and operations phases.

(22) The total number of vehicles would rise during the combined Step II construction phase and Step I operations phase to approximately 4,448 then decline to about 2,942 per day as Step II operations get underway. Throughout the Step I construction phase 220 trucks would travel into and out of the Lakefront site daily. During the combined Step II construction and Step I operations phase the total number of trucks would rise to 764. The number of trucks would continue to rise reaching a maximum of 1,220 during Step II operations. Construction and operation of the proposed plant would have a direct impact on the highway network of the Regional Study Area. Assuming access is provided via direct link with Interstate 90, traffic movements associated with the proposed mill are predicted to be greater during the hours of 7:00 a.m. to 8:00 a.m. In 1981, traffic congestion can be expected at the State Line Road entrance to the proposed mill, the intersections of Route 6N with SR-5 and U. S. 20, and the intersection of U. S. 20 and Route 5. By 1985, traffic congestion would be expected at the intersection of SR-7 and U. S. 20 in Conneaut and all of the intersections identified in 1981 except the point where SR-5 and U. S. 20 join east of the Ohio State line. In 1990, traffic congestion would be expected in downtown Conneaut, the State Line Road entrance to the proposed mill, the intersection of U. S. Route 6N and U. S. 20 and SR-5, and the point

where SR-5 and U. S. 20 join. Increased barge and deep draft vessel traffic during plant construction and operation may interfere with the navigation of small craft in Conneaut Harbor. The addition of plant-related rail traffic would not hinder the movement of police, medical emergency or fire fighting equipment at grade crossings significantly beyond that which already exists under baseline conditions.

(23) Construction and operation of the proposed Lakefront plant would induce development primarily within the Principal Study Area. As this development occurs, vegetation would be removed and soil would be disturbed. Typical erosion rates could be as high as 20 tons/acre-year. Streambank erosion would accelerate as runoff volume from altered areas increases.

(24) Based on 1985 and 1990 air quality projections, the proposed plant would not exceed particulate and sulfur dioxide annual standards. A small increase in carbon monoxide levels would be expected during peak traffic periods at intersections along highway access roads to the proposed plant.

(25) Noise increases of 2-3 dBA which are not considered significant would be experienced in northwest Conneaut during the plant construction phase. During plant operations an increase in noise levels of one dBA would be expected in Conneaut while at all other receptor locations process noise would be 10 dBA lower than ambient levels. Changes in noise levels associated with plant-related usage of railroads, waterways, and highways would be negligible.

(26) Hydrocarbon emissions associated with the proposed plant and related secondary development are projected to increase a maximum of eight percent in 1985 or 0.05 ppm. Emissions of NO_x in the Regional Study Area are expected to rise by 26 percent in 1985 and 1990 as a consequence of plant-related development.

(27) An analysis performed to assess the combined effects of the proposed Lakefront plant and proposed Coho generating station on air quality identified SO_2 as the pollutant of primary concern. The modeling results show that the additional increments from the two plants, six ug/m^3-annual, 87 ug/m^3-24 hour, and 326 ug/m^3-3 hour, would not violate the PSD regulation and that the maximum total concentrations (additional increment plus maximum background) would not exceed ambient air quality standards.

(B) ADVERSE ENVIRONMENTAL EFFECTS: The proposed Lakefront Steel Plant would have the following primary and secondary environmental effects.

Primary Impacts

(1) The proposed action would result in the replacement of 7,500 feet of Turkey Creek channel with 5,600 feet of culvert. The culvert would be installed in the mainstem starting from a point 1,500 feet upstream of Lake Erie and extending to State Line Road. This would reduce the overall stream length from 91,000 feet to 89,100 feet. The difference of 1,900 feet results from straightening meanders. Aquatic habitat utilized by resident warm water fish species and migratory cold water species entering from Lake Erie would be permanently reduced in this reach.

(2) Construction and operation of the proposed Lakefront facility may adversely affect public use of the beach fishing area at the mouth of Turkey Creek since the applicant will allow access only by boat. Fencing at the site perimeter would restrict fishermen access to the lake shoreline and US East Breakwater Extension bordering Conneaut Harbor. The applicant's mitigation plan specifies habitat improvements downstream of the culvert with continued stocking of salmonids by the State of Ohio, while Pennsylvania Fish Commission personnel would be allowed to manage the upper watershed of Turkey Creek. Stream flow augmentation to facilitate passage of salmonids is also being considered. However, the mitigative actions are still subject to refinement by the applicant and appropriate State resource agencies.

(3) Construction of the proposed steel mill would affect 1,766 acres of the 2,760 acres comprising the Lakefront site. This area would be cleared of riparian and upland habitat composed of various seral stages. All wildlife including important game species and nonconsumptive species of recreational value would be adversely effected. The herpetefauna population would probably be destroyed during the construction phase. Other more mobile wildlife would move to other areas where stress, starvation and disease could ultimately eliminate these individuals. Migrating wildlife which formerly used this area would encounter habitat reductions, increased potential for collisions with tall structures such as exhaust stacks and transmission lines and possible contamination from use of such areas as ash-settling ponds. Noise and other disturbances during plant construction and operation may reduce the wildlife utilization of surrounding area.

(4) During the construction phase blasting may be required to effect the installation of the intake and discharge structures. Detonation of explosive charges may injure or kill fish in the immediate vicinity of the worksite. In any case, blasting and dredging operations could cause resident and migratory fish species to avoid the area as long as such activities are in progress.

(5) Land surface erosion would occur during the construction of the proposed plant and to a lesser degree during facility operations. The erosion would be reduced by application of the erosion control plan for the entire Lakefront site.

(6) Dust generated during onsite construction activities would have a minor adverse impact on air quality.

(7) Emissions from the proposed Lakefront plant would cause some deterioration of regional air quality. Major operational impacts on air quality are those associated with increased concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), hydrocarbons, and total suspended particulates. All emissions are expected to be within allowable Class II nondegradation limits and would occur throughout the projected life of the facility.

(8) Sulfur dioxide and the various oxides of nitrogen produced by the Lakefront facility could react synergistically to cause damage to sensitive agricultural crops, nursery stock, and native vegetation at lower concentrations than would otherwise occur on an individual basis. Available data are not sufficient to predict the synergistic effect or long-term effect of low concentrations of plant emissions on area vegetation or wildlife. The applicant has agreed to initiate a monitoring program to identify and define the effects on vegetation.

(9) The formation of sulfates from sulfur dioxide emitted by the proposed plant may, under worst case conditions, contribute to adverse health related effects when added to already high ambient levels.

(10) Runoff from the plant site during the construction and operation phase would contain oxygen demanding substances, dissolved nutrients, and suspended solids which could adversely impact Lake Erie water quality or other receiving water bodies.

(11) Dredging activities and construction associated with the extension of the Conneaut Harbor East Pier and unloading dock would have a short-term adverse impact on harbor water quality. To reduce the commitment of aquatic habitat and improve water circulation in Conneaut Harbor, the applicant has redesigned the pier and unloading dock so that it is supported by a system of individual steel sheet pile cells spaced approximately 50 feet apart.

(12) During construction, surface water runoff from disturbed and undeveloped sections of the Lakefront site, if uncontrolled, could enter Turkey Creek and Conneaut Creek causing erosion. Should this occur, sediment laden water would enter the creeks and eventually Lake Erie. Under high flow conditions increased suspended solids

and BOD levels would be expected. Utilization of an effective management plan for erosion control at the Lakefront site would reduce sediment loading significantly.

(13) Once the culvert is installed some surface water runoff from the developed areas of the site could enter the open sections of Turkey Creek above and below this structure along with water from that portion of the Turkey Creek watershed undisturbed by the proposed project. Under low flow conditions, the introduction of contaminated runoff that is not impounded could significantly affect water quality in the creek. During high flows scouring would occur which would tend to flush accumulated contaminants from the plant surface water runoff into the creeks and eventually Lake Erie. Proper diversion, collection, and treatment of contaminated runoff would eliminate these potential impacts.

(14) Under typical conditions plant effluent is expected to meet Ohio Water Quality Standards for all parameters except phenols and total dissolved solids. Even though the dissolved solids concentration added by the Lakefront facility is relatively small it can exceed standards when combined with the already high ambient levels which typically occur in Lake Erie. Ohio standards are projected to be exceeded for a total distance of about 1,500 feet from the Lakefront plant outfall. Beyond this point, phenols are expected to meet the designated standard of .001 mg/liter.

(15) Construction of permanent and temporary access roads and railroad spur would require the permanent commitment of 76 acres of wildlife habitat.

(16) The combination of plant-related sulfur dioxide emissions with water in the atmosphere may increase the potential for acid rain precipitation downwind of the facility.

(17) Clearing, grubbing, and grading activities would cause some increased siltation and sedimentation on site creeks, watercourses adjacent to the Lakefront site and Lake Erie. High levels of solids and siltation could cover benthos, decrease primary productivity and result in some mortality of ichthyoplankton, young-of-the year fish, and zooplankton.

(18) The originally planned construction of the unloading dock and extension of the east harbor entrance pier would have resulted in the elimination of 45,000 square feet of benthic habitat. However, the applicant has revised the design so that the dock would be supported by individual steel sheet pile cells spaced at intervals of about 50 feet. Under these circumstances the commitment of benthic habitat would be reduced to 22,132 square feet.

(19) Pile driving, dredging, and filling associated with the construction of offshore structures would lead to a temporary increase in turbidity levels and subsequent siltation of adjoining aquatic habitat. Periodic maintenance dredging of about 220,000 square feet of lake bottom could render these areas less suitable for spawning and inhibit reestablishment of diverse benthic macroinvertebrate communities.

(20) During plant operations aquatic organisms entrained in the intake stream would incur nearly 100 percent mortality. The loss of ichthyoplankton may have a measurable local impact on future year classes of certain Lake Erie species. The applicant will perform additional ichthyoplankton sampling to determine if the operation of the intake at the selected site would minimize losses. The resultant data will be evaluated by the USEPA and the appropriate State agencies prior to final approval of the intake structure during the NPDES permit review process.

(21) Heavy metals, organics, and trace elements would be discharged from the plant. After mixing with lake water for a relatively short period of time, the concentrations of most of these constituents would be within limits acceptable to aquatic organisms. However, some heavy metals and trace elements can accumulate at sublethal levels in the tissues of aquatic organisms. In the high velocity portions of the wastewater plume ammonia levels could reach levels lethal to certain fish species.

(22) The spotted turtle (Clemmys guttata), which, is endangered under Ohio law, occurs most frequently in the shallow pools and ditches of the Lakefront site paralleling the southern edge of the Norfolk and Western Railroad right-of-way. This habitat could have been eliminated through changes in surface drainage resulting from the originally proposed diversion of Turkey Creek. However, the diversion plan has been rejected by the applicant and the habitat indicated above is now included in an area that would be managed as a wildlife mitigation area. A limited number of spotted turtles have been observed at other locations which would be developed on the Lakefront site. Access to the site would be provided should the Ohio Department of Natural Resources decide to capture and relocate these individuals.

(23) Although there is a potential for impingement of fish at the intake structure, the proposed installation of wedge wire screens, or an equivalent system defined as Best Available Technology, should minimize losses of young-of-the-year and adult fish species.

Secondary Impacts

(1) Increase in the cost of living within the Local Study Area would adversely affect residents on fixed incomes and low income families desiring to purchase homes.

(2) Large additions to the housing stock would be needed in the Local Study Area to accommodate the plant induced influx of new residents. The lead time required for construction and low turnover rate for existing homes may create a housing shortage.

(3) Some school districts in the Regional Study Area would experience an increase in operating costs which could only be offset by an increase in property taxes. Enrollment capacities may be slightly exceeded in the Girard District elementary school and Buckeye District elementary and senior high schools. In the Local Study Area an addition to the Conneaut Senior High School would be needed in 1981 to offset plant-related increases in enrollment while an addition to the junior high school would be needed in 1985. To alleviate crowding in the lower grades a new elementary school would also be required with construction beginning in 1986.

(4) An addition to inpatient facilities and services would be necessary at Brown Memorial Hospital in Conneaut and the Ashtabula General Hospital. Additional physicians would also be needed as hospital facilities are expanded.

(5) The plant related increase in traffic particularly in the Local Study Area could result in the diversion of police officers from their regular assignments to traffic control.

(6) Increased demand on recreation facilities such as beaches, boat launching and mooring areas, fishing sites and parks which are already heavily used could result in overcrowding and increased maintenance costs.

(7) A property tax rate increase may be required in the Conneaut area School District during 1981 to fund the cost of the addition to the senior high school. Increased operating expenses in the Buckeye Local School District, Ashtabula Area City School District, the Girard School District and the Fairview School District may require the increase of property tax rates.

(8) Some expansion of existing central water supply systems in the Ohio Local Study Area would be required to serve the plant-related increase in population. Secondary development in the Pennsylvania Local Study Area would require the installation of a new central water supply system earlier than would be expected under

baseline conditions. The system would cost almost one million dollars. Water rates for users of the new system would be significantly higher than those charged in other communities.

(9) Increased sewage flows associated with secondary development would add biological oxygen demand and nutrient levels to receiving waterbodies. Sewer construction costs in new developments would be borne by developers and passed on to home purchasers. Expansion of the Conneaut Sewage Treatment plant could be required in 1990 to offset the increase of 0.7 MGD in sewage flows. The added population in Springfield Township and East Springfield Borough is expected to require centralized sewage treatment by 1990. Such treatment could be provided by the Northwest Erie County Sewer Authority. Expansion of the proposed treatment plant and construction of interceptors is estimated to cost $2.35 million and $4.75 million, respectively. Added costs associated with interceptor construction and plant operation and maintenance would be incurred in Erie, PA and Ashtabula, OH.

(10) Transportation of materials and workers during the construction and operation of the proposed plant would cause traffic congestion during peak hours at certain major intersections near the site. Increased deep draft vessel traffic in Conneaut Harbor may interfere with small craft usage of the inner and outer harbor areas.

(11) If secondary development is not controlled through appropriate local zoning ordinances or other types of regulation, changes in land use could occur.

(12) Facility induced secondary development is expected to result in an increase in the volume of sewage treatment effluent discharged to Lake Erie directly or by way of its tributaries. Urbanization of areas surrounding the proposed plant site would increase the volume of runoff and may accelerate land surface erosion (during construction). Sediment laden waters entering area creeks and streams would have an adverse impact on water quality and subsequent siltation could degrade spawning habitat for resident and migratory fish species. Accidents involving trucks, railroad stock, or lake vessels carrying plant shipments could result in the spillage of materials into area waterbodies.

(13) Development induced by the proposed action would involve construction dewatering, topographic alterations, land clearing and grubbing and land use change. These activities would temporarily depress groundwater table elevations and alter runoff recharge ratios.

(14) Flood damage may occur if local communities do not regulate secondary development in flood prone areas. Secondary development associated with the proposed plant would involve some areas using groundwater aquifiers as the principal water supply. The addition of a significant number of users over the long-term could deplete ground water resources.

4. ALTERNATIVE TO THE PROPOSED ACTION:

- No Action
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    - Wastewater Equalization
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- Alternative Operation and Maintenance Methodologies
- Alternative Intake and Discharge Systems
- Alternatives to the Original Proposal to Fill and Divert Turkey Creek
- Alternative Pier Extension and Dock Design

5. COMMENTS:

a. Comments on the Draft Environmental Impact Statement were requested from the general public as well as the following Federal, State, and local governmental agencies, citizen groups, and environmental organizations:

U. S. Department of Agriculture
U. S. Coast Guard
U. S. Department of Commerce
U. S. Department of Energy
U. S. Environmental Protection Agency
U. S. Geological Survey
U. S. Federal Regional Council
U. S. Department of Health, Education, and Welfare
U. S. Department of Housing and Urban Development
U. S. Department of the Interior
U. S. Department of Labor
Advisory Council on Historic Preservation
Appalachian Regional Commission
Federal Aviation Administration
Federal Highway Administration
Federal Railroad Administration
General Services Administration
Great Lakes Basin Commission
International Joint Commission
Interstate Commerce Commission
National Endowment for the Arts
National Marine Fisheries Service

Nuclear Regulatory Commission
St. Lawrence Seaway Development Corporation
Water Resources Council
Kent State University
Office of the Governor, Ohio State Clearinghouse
Ohio Department of Administrative Services
Ohio Department of Economic and Community Development
Ohio Department of Health
Ohio Department of Natural Resources
Ohio Department of Transportation
Ohio Environmental Protection Agency
Ohio Historical Society
Ohio State University
Ashtabula County Metropolitan Park Board
Ashtabula County Planning Commission
Ashtabula Farm Bureau Federation
Ashtabula Port Authority
City of Ashtabula Division of Housing and Community Development
City of Conneaut, Office of the Mayor
Conneaut Department of Housing, Planning, and Community Development
Conneaut Planning Commission
Conneaut Port Authority
Pennsylvania Department of Environmental Resources
  Erie County Health Department
  Pennsylvania Department of Transportation
  Pennsylvania Fish Commission
  Pennsylvania Game Commission
  Office of Coastal Zone Management
  Office of the Governor
Pennsylvania Department of Historic Sites and Property
Pennsylvania State Office of Planning and Development
Pennsylvania State University
Slippery Rock State College
Carnegie-Mellon University
Cornell University
Albion Borough, Pennsylvania
Conneaut Township
Cranesville Borough
Crawford County Planning Commission
East Springfield Borough
Edinboro Borough
Edinboro State College
Elk Creek Township
Elk Creek Zoning Committee
City of Erie
County of Erie
Erie County Commission
Erie County Conservation District

Erie County Council
Erie Metropolitan Planning Commission
Erie Port Commission
Franklin Township
Gannon College
Girard Borough
Girard Township
Northwest Pennsylvania Futures Commission
NWPA Regional Planning and Development Commission
Springfield Township
Venango County Planning Commission
Agricultural Organizations of Erie County
Ashtabula Area Development Association
Citizens for Land and Water Use
Concerned Citizens of Conneaut
Eastgate Development and Transportation Agency
Erie Building and Construction Trade Council
Erie Engineers Society and Council
Great Lakes Tomorrow
League of Ohio Sportsmen
League of Women Voters Great Lakes Task Force
Manufacturers Association of Erie
Minnesota Department of Natural Resources
National Audubon Society
National Grape Cooperative Association, Inc.
National Wildlife Federation
Natural Resources Defense Council
Nature Conservancy
New York Great Lakes Grape Industry Program
New York State Agricultural and Experiment Station
New York State Public Service Commission
Ohio Environmental Council
Ohio Conservation Foundation
Pennsylvania Environmental Council
Pennsylvania Federation of Sportsmen
Presque Isle Audubon Society
Ruffed Grouse Society
Sierra Club
State University College at Buffalo, Great Lakes Laboratory
Three Rivers Watershed District
Trout Unlimited
Western Pennsylvania Conference of the United Methodist Church
Western Pennsylvania Conservancy
Western Reserve Economic Development Agency

b. During the Review period for the Draft Environmental Impact Statement written comments were received from the following agencies, groups, and individuals:

U. S. Department of Agriculture
U. S. Department of Commerce
U. S. Department of Energy
U. S. Environmental Protection Agency
U. S. Department of Health, Education, and Welfare
U. S. Department of Housing and Urban Development
U. S. Department of the Interior
U. S. Department of Transportation
U. S. Nuclear Regulatory Commission
Tennessee Valley Authority
Ohio Environmental Protection Agency
County of Ashtabula Board of County Commissioners
Mayor, City of Conneaut
Pennsylvania Fish Commission
Pennsylvania Game Commission
Pennsylvania Department of Commerce
Pennsylvania Department of Environmental Resources
Pennsylvania Department of Transportation
Erie County Health Department
Crawford County Planning Commission
Crawford County Tourist Association
Northwest Pennsylvania Regional Planning and Development Commission
Northwest Pennsylvania Futures Committee, Inc.
Borough of Albion
Mayor, City of Erie
City Manager, Meadville
Springfield Township
South Shenango Planning Commission
Lieutenant Governor, State of New York
Concerned Citizens of Conneaut
Conneaut Ad Hoc Committee
Crawford County Sportsmen's Council, Inc.
Downwind Neighbors
Erie County Farmers Association
Fairview Evergreen Nurseries, Inc.
League of Women Voters of Erie County
Manufacturers Association of Erie
National Audubon Society
New York State Agricultural Experiment Station
New York State Grape Production Research Fund, Inc.
Sierra Club
Trout Unlimited
Donald D. Anthony
Gerald C. Allender

Joan N. Barnett
Richard G. Beck
William Branigan
Helen W. Clark
Kirk Evans
Karl E. Ebert
Gary Garn
Charles R. Gaukel
Janice Gustafson
Gertrude Hirsimaki
Richard T. Kleppick
Donald Koppelman
Alvin W. Levinhagen
Richard J. Markiewicz
Edward D. Mentz
Mrs. Charles A. Mertens
Tom Michlovic
Mark Montefiori
John Nuber
Norman Phillips
Collette Piotrowicz
Leroy P. Tillman
Bradley T. Shaw
Bob Wellington
L. E. Wellington
Rachael Williams
John Wisinski

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GLOSSARY

A. DEFINITIONS

abiotic - Independent of influence by living organisms.

adverse effect or impact - Addition of a new element into the environment (or a change in an existing element's presence) that causes a biotic population or natural resource (or the human use) to be less safe, less healthful, less abundant, less esthetically or culturally pleasing; or, if the addition or change tends to lower the quality of renewable resources and human use, or to impair the recycling of depletable resources; or if enforcement of one or more elements is at the expense of one or more other elements under existing conditions. (Whether an impact is adverse or beneficial may depend on the viewpoint of the observer.)

aerobic - Characterized by the presence of oxygen.

anadromous - Running upwards or away from the sea or other large body of water.

anaerobic - Characterized by the absence of air or free oxygen.

ancillary facility - Those facilities not a part of proposed project but which will be added to augment it.

anhydrous - Free from water, especially water of crystallization.

annealing - Heat treatment to remove stress; "soften" by altering mechanical properties, refine grain structure, or produce a definite microstructure.

anoxic - Characterized by an abnormally low amount of oxygen.

baseline - Existing conditions without impact from a proposed project.

battery - Row of coke ovens.

benthos - The ecological community associated with the substrate (bottom) in an aquatic environment.

Biochemical Oxygen Demand (BOD) - The amount of dissolved oxygen required to meet the metabolic needs of aerobic organisms in water that is rich in organic matter, such as sewage. (Also known as Biological Oxygen Demand.)

biodegradation - The breakdown or decomposition of a substance by organisms.

biomass - The dry weight of living matter, including stored food, present in a species (or community) population and expressed per unit of a given area or volume of habitat.

biota - The animal and plant life of a region.

blast furnace gas - A by-product of an iron blast furnace useful as a fuel in a number of applications in a steel plant.

blowing - Forcing oxygen into a blast furnace.

BOP - Basic Oxygen Steelmaking Process.

borrow area - An area from which fill material is excavated for use as fill at another location.

bosh - Inverted conical section of a blast furnace where the melting starts.

brownfield plant - A plant essentially constructed at a site having pre-existing steel plant facilities.

Btu (British thermal unit) - A unit of heat energy equal to the heat needed to raise the temperature of one pound of air-free water 1°F (from 60°F to 61°F) at a constant pressure of one standard atmosphere.

burden - Solid materials entering the top of a blast furnace.

by-product - A product derived from a process and captured for in-plant use or sale to outside consumers.

charging - Depositing material into a blast furnace.

chemical oxygen demand - Oxygen required; to oxidize organic matter in a sample under specific conditions of oxidizing agent, temperature, and time.

COG - Gas resulting from the coking process. COG contains hydrogen, methane, ethane, carbon monoxide, carbon dioxide, ethylene, propylene, butylene, acetylene, hydrogen sulfide, ammonia, oxygen, and nitrogen.

coke breeze - Undersized coke used as fuel in steel plant boiler houses.

coking - Transforming coal into coke by distillation.

commuters - Workers who travel daily from outside the Principal Study Area but within 100 driving miles.

dB (decibel) - Sound pressure levels vary so widely in magnitude that they are usually expressed using a logarithmic (decibel) scale. A sound pressure level in decibels is defined as 20 times the logarithm to the base 10 of the ratio of a given sound pressure to a reference pressure.

dBA - An A-weighted sound level, in decibels; refers to a sound-level measuring method, usually labeled "A" on sound level meters, which is designed to approximate the hearing sensitivity of the human ear by filtering out low-frequency sounds.

detritus - Organic matter undergoing decomposition, especially partially decomposed plant material (including microbial growth).

direct impact - An impact (change) resulting specifically and immediately in response to any facet of the proposed action. Such impacts would not occur if the proposed project were not undertaken and completed.

dummying - Passing a rolling work piece through open rollers.

ecosystem - A biotic community considered together with the nonliving factors of its environment as a unit.

endangered species - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the Secretary of the Interior to constitute a pest whose protection under the provisions of the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man. (PL 93-205) In this report, the term is also used in the vernacular for species believed to be suffering serious population declines.

entrainment - The act of one substance being captured within or incorporated into another.

eutrophic - A condition in which a water body has advanced in age biologically so as to exhibit higher primary productivity than oligotrophic systems.

flushing liquor - The condensate from the volatile products driven off in the coking process.

flux - A substance which renders impurities more easily fusible in the smelting process.

fugitive air emissions - Any air contaminant emitted into the outdoor atmosphere in any manner other than through a flue.

greenfield plant - A plant constructed at a new site without any pre-existing steel plant facilities.

habitat - The environmental setting where an organism or community exists and can complete essential parts of its life cycle.

hearth - Lower portion of a blast furnace where the metal and slag collect.

heterotrophic - Obtaining nourishment from the ingestion and breakdown of organic matter. Animals are heterotrophs.

hi-vol coal - High volatility coal, i.e., coal having high fluidity after heating and thus producing porous, weak coke.

historic site - Any district, site, building, structure, or object significant in American history, architecture, archeology, or culture, included or eligible for inclusion in the National Register of Historic Places. (See PL 89-665)

hot metal - Liquid pig iron.

hydrocarbon - Any compound composed solely of carbon and hydrogen.

hydrology - The science dealing with the properties, distribution, and circulation of water.

impingement - The act of one substance being involuntarily attached to another.

indirect impact - Impact of the proposed Lakefront plant on value of shipments, payrolls, and level of employment in supplier and customer-related sectors in the Principal Study Area.

induced impact - Impact of the proposed Lakefront plant on value of shipments, payrolls, and level of employment in newly created or expanded population-related sectors in the Principal Study Area as a result of the increased number of residents.

invertebrate - Any animal lacking a backbone.

irretrievable - Something (e.g., a resource commitment) that is incapable of being recovered during a finite period of time. (The finite period of time varies according to the feature affected; for example, it can extend over the project life of 30 years, or for a period of time after a particular project activity or occurrence (e.g., a pipeline construction or an acute oil spill).

larry car - A rail car riding over the top of a battery of ovens dispensing coal into the ovens to make coke.

larvae - The first independent, immature stages of organisms which develop from fertilized eggs and sometimes undergo a series of form and size changes before assuming characteristic features of the parent.

leach - To remove soluble constituents by contact with water.

life cycle - The functional and morphological stages through which an organism or species passes.

light oil - A clear yellow-brown oil somewhat lighter than water.

lo-vol coal - Low volatility coal; i.e., coal having low fluidity upon heating.

macrophyte - A macroscopic plant, especially in an aquatic habitat.

movers - Workers who move with their families to the Principal Study Area on a permanent basis.

negative effect - An effect considered harmful.

noise - Unwanted sound.

nursery ground - A place where young organisms, either plant or animal, are reared (often applied to salt and brackish marshes in coastal areas with respect to marine organisms).

nutrient - Any substance which promotes growth or provides energy for physiological processes.

original residents - Workers living within the Principal Study Area prior to plant construction.

pH - A logarithmic scale of measurement for acidity and alkalinity.

photochemical oxidant - Any of the chemicals which enter into oxidation reactions in the presence of light or other radiant energy.

photosynthesis - The process that occurs in green plants in which simple sugars are formed from carbon dioxide and water in the presence of light and chlorophyll; a process in which light or radiant energy is converted to chemical energy and stored in the molecules of carbohydrates; a basic process of primary productivity.

pickling - The use of chemical action to remove the hard black oxide formed on a steel bar during hot-rolling or to remove red rust formed by exposure to air.

pig iron - Metallic product of a blast furnace when it contains over 90 percent iron.

plankton - Organisms living in any body of water that drift with the current; usually microscopic in size; phytoplankton refers to the plant constituents; zooplankton, to the animal constituent.

plant-related impact - Includes direct, indirect, and induced impacts of the proposed plant.

positive effect - An effect considered beneficial.

protected species - In this report, this term pertains to species given special recognition by agencies or interest groups because of their apparent scarcity in the Regional Study Area.

quenching - Spraying water on hot coke from the coking oven to cool the coke rapidly avoiding further combustion.

receptor - An organism exposed to a given impact potential.

riffle - A stream location where the water moves rapidly due to physical constraints.

riparian - Subject to the direct influence of river waters.

scarfing - Removing the surface from steel with oxygen torches.

sediment disturbance - Excavation, dredging, spoil disposal, or other alteration to the physical and biological character of the soil.

sere - A series of ecological communities that succeed one another.

sinter - Coal feedstock formed by heat and pressure applied to porous coal dust and/or waste coal pieces.

sintering - Burning a fuel of high ash content under controlled conditions converting a variety of materials (naturally fine ores, ore

fines from screening, flue dust, ore concentrates, and other iron-bearing materials of extremely small particle size) into a granular, relatively coarse form (sinter) that is suited for use in a blast furnace.

skull - Shell of metal that occasionally solidifies on the sides and bottom of the interior or a ladle.

slab - Any oblong piece of semi-finished steel to be rolled into a plate. Slabs are mostly 2 to 9 inches thick and 24 to 60 inches wide.

slag - Fused product formed by the action of a flux on the impurities in a metal or upon the gangue of an ore or fuel.

species diversity - A term indicating the amount of biological variation in a community; roughly equivalent to the number of species present in an area. Specific statistical indices can be applied to this general concept to provide a numerical indication of the degree of diversity.

steel plate - Hot-rolled, wide, flat section stock greater than four millimeters (0.16 inch) thick and having a specific weight greater than 35 kilograms per square meter (seven pounds/square foot).

subsidence - A local mass movement that involves principally the gradual downward settling or sinking of the earth's surface with little or no horizontal motion.

swarf - Dust from abrasive grinding.

tar - The organic matter that separates by condensation from the gas in the coking process.

taxa - A classification system based on morphological differences.

threatened species - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (PL 93-205)

trophic - Defines a level of function in an ecosystem.

tundish - A vessel into which steel is poured from the ladle as an alternative to pouring directly into a mold.

turbidity - The state, condition, or quality of opaqueness or reduced clarity of a fluid, due to the presence of suspended matter.

tuyere - A water-cooled opening through which hot air is blown into the bottom of a blast furnace at the top of the hearth.

weeklies - Workers who acquire temporary quarters within the Principal Study Area, but do not live there on a permanent basis. On weekends these workers return to their permanent homes which are assumed to be outside of the 100-mile commuting distance.

wind rose - A diagram in which statistical information concerning direction and speed of the wind at a location may be summarized; such information is used to model the surface current transport of possible oil spills and the dispersion of air contaminants.

B. ABBREVIATIONS AND UNITS

AQCR - Air Quality Control Region

atm - atmosphere

BACT - Best Available Control Technology

BACTA - Best Practicable Control Technology Available

BADCT - Best Available Demonstrated Control Technology

BaP - benzo (A) pyrene

BATEA - Best Available Technology Economically Achieveable

BCF - billion cubic feet

BFG - blast furnace gas

BOD - Biochemical (Biological) Oxygen Demand

BOF - basic oxygen furnace

BOP - basic oxygen process

Btu - British thermal unit

cc - cubic centimeter

CDM - Climatological Dispersion Model

cfm - cubic feet per minute

cfs - cubic feet per second

cm - centimeter

COD - Chemical Oxygen Demand

COG - Coke Oven Gas

CPI - Consumer Price Index

dBA - A-weighted sound level in decibels

°C - degrees Celsius

°F - degrees Fahrenheit

DNREP - Division of Natural Resources and Environmental Protection

DO - Dissolved Oxygen

EDA - Economics Development Administration

EDF - Environmental Defense Fund

EGL - Effluent Guideline Limitations

EIA - Environmental Impact Assessment

EIS - Environmental Impact Statement

EL - Effluent Limited

EOD - End of Discharge

EOT - Electric Overhead Traveling

EPA - Environmental Protection Agency

F.I.R.E. - Finance, Insurance, and Real Estate

ft - foot

g - gram

GNP - Gross National Product

gr - grain

gal - gallon

gpd - gallons per day

gpm - gallons per minute

kg - kilogram

km - kilometer

kVA - kilovolt Amp

kW - kilowatt

kWA - kilowatt amps

kWh - kilowatt hour

l - liter

LAER - Lowest Achievable Emission Rate

lb - pound

LFPR - Labor Force Participation Rates

m - meter

MATC - Maximum Acceptable Toxicant Concentration

MFC - million cubic feet

mg - milligram

MGD - millions of gallons per day

mi - mile

mm - millimeter

MMSCFD - millions of standard cubic feet per second

mph - miles per hour

ug - microgram

um - micrometer

MW - megawatt

NAAQS - National Ambient Air Quality Standards

NASN - National Air Surviellance Network

NCWQ - National Council on Water Quality

NEPA - National Environmental Policy Act

NESHAP - National Emission Standards for Hazardous Air Pollutants

nm - nanometer

Nm^3 - normal cubic meter

NPDES - National Pollutant Discharge Elimination System

NRDC - Natural Resource Defense Council

NWQI - National Water Quality Inventory

ODOT - Ohio Department of Transportation

PAH - Polycyclic Aromatic Hydrocarbons

PDOT - Pennsylvania Department of Transportation

PL - Public law

POM - Polycyclic Organic Matter

ppd - part per billion

ppm - part per million

ppt - part per trillion

PSD - Prevention of Significant Deterioration

psi - pounds per square inch

psig - pounds per square inch gauge

RCRA - Resource Conservation and Recovery Act

rpm - revolutions per minute

scfm - standard cubic feet per minute
scm - standard cubic meter
SIP - State Implementation Plans
SMSA - Standard Metropolitan Statistical Area
SNAP - Sulfuric-Nitric Acid Pickling
TGD - thousand gallons per day
TOC - Total Organic Carbon
TSCA - Toxic Substances Control Act
TSP - Total Suspended Particulate
VOL - Volatile Organic Analysis
WQL - Water Quality Limited
yd - yard

FOREWARD

On 2 March 1977, the United States Steel Corporation filed an application for a Department of the Army permit to perform certain work in the vicinity of Conneaut, OH, that is subject to regulation under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act. Specifically, authorization was requested to construct a process water intake and discharge system in Lake Erie; modify and extend the existing east channel entrance pier and install a raw materials conveyor system in Conneaut Harbor; culvert Turkey Creek between State Line Road and a point 1,500 feet upstream of Lake Erie; and to dredge the area adjacent to the proposed extended pier in Conneaut Harbor. The United States Steel Corporation noted in their application that the work proposed was ancillary to the establishment of a large new source steel manufacturing complex which is planned for a 2,800 acre lakefront tract of land between Conneaut, OH, and West Springfield, PA.

The purpose of the facilities for which authorization is requested is to provide the proposed mill with a source of cooling and process water which is vital to the production of liquid steel. The raw materials conveyor system will supply the necessary raw material components used in steel production in the proposed mill. When considered independently, both the intake and discharge and raw materials conveyor have a relatively minor impact on the environment. However, the development of a new steel mill, as a consequence of the installation of these structures, will have a significant and measurable impact on the human and natural environment, both locally and regionally.

In view of these facts, and in compliance with the requirements set forth in the National Environmental Policy Act of 1969, a determination was made that the analysis of environmental impact must apply to the entire steel manufacturing complex and not just the work specifically regulated by the Department of the Army permit. Further, the determination found that the proposed activity would significantly affect the quality of the human environment and a decision was made that an Environmental Impact Statement (EIS) was essential for evaluation of the permit application.

The U. S. Environmental Protection Agency (EPA) has delegated the authority to issue permits under the National Pollutant Discharge Elimination System Program (NPDES) to the State of Ohio. Although EPA retained the right to review such actions it no longer asserted direct regulatory control over effluent discharges so long as the State program remained consistent with established NPDES guidelines. As a consequence of this action, only the Corps of Engineers retained

direct regulatory authority over the proposed project. Further analysis of the Federal regulatory requirements indicate that EPA air quality permits and FAA aircraft clearances would be required but that these actions would not be initiated until well after the Corps of Engineers had completed action on its own permit application. Therefore, the Corps assumed the administrative role of lead Federal agency during the processing of the Department of the Army permit application and the development of the Environmental Impact Statement. On 11 March 1977, the Corps of Engineers, Buffalo District, announced in their Public Notice No. 77-492-3, that they would take this lead agency responsibility.

The reviewer is advised that the designation of the Corps as "lead agency" does not in any way imply a broadening of regulatory authority beyond that which is mandated by law. Whenever, more than one Federal agency is directly or indirectly involved in a complex proposal a lead agency will be selected to oversee the organization and coordination of the environmental impact statement. Further the potential issuance of the Corps of Engineers permit does not set a precedent for the granting of other regulatory authorizations nor does it circumvent the applicant's responsibility to obtain these permits.

To insure that the concerns of the regulatory agencies were fully identified and that many disciplines required to adequately assess the environmental impact of this facility were represented, an interagency technical team was established. The team is composed of an interdisciplinary group of individuals representing the U. S. Army Corp of Engineers, U. S. Environmental Protection Agency, Federal Regional Council, U. S. Fish and Wildlife Service, National Marine Fisheries Service, and their counterpart agencies within the State of Ohio and the Commonwealth of Pennsylvania. Representatives of the U. S. Steel Corporation and their consultants, also served on the technical team.

During the several months preceeding the preparation of the EIS, the technical team has met many times to evaluate various aspects of the U. S. Steel Corporation proposal. The team has consistently scrutinized and evaluated the data collection effort by the applicant to insure that there is sufficient information to analyze the overall impact of the proposed facility on the environment. Team members have identified the standards which must be met by the facility to insure that the most environmentally acceptable design is achieved. The overall net effect of the team is to assist the Corps in the development of a complete and comprehensive Environmental Impact Statement.

This Environmental Impact Statement identifies the primary and secondary impacts associated with the authorization of the Federal Permits necessary to construct and operate the proposed U. S. Steel Corporation Lakefront Plant. It has been prepared by the U. S. Army Engineer District, Buffalo in accordance with the requirements of the National Environmental Policy Act of 1969 Department of the Army regulation ER-1105-2-507 (15 April 1974) and 33 CFR 320-329 (19 July 1977), and the guidelines developed by the Council on Environmental Quality (1 August 1973).

The Environmental Impact Statement (EIS) is prepared first as a draft. This document is circulated through the various Federal, State, and local agencies as well as the general public for review and comment. A final EIS is then prepared in which comments are addressed and resultant project modifications identified. The completed final EIS is then filed with the Council on Environmental Quality at which time it is again distributed to the general public for review for 30 days. At the end of this review period. the District Engineer will then review the entire application file and make a decision on issuance of the Department of the Army permit.

The Environmental Impact Statement is not in itself a decision making document. It will be used to assist the District Engineer in the public interest review prior to determining whether or not the Department of the Army permit, as requested, can be granted.

To insure availability during the designated review periods, copies of the EIS have been placed in the reference sections of the public libraries within the primary and secondary impact sections. Those individuals not able to secure a copy of the statement for review should contact the District Engineer by writing in care of the U. S. Army Engineer District, Buffalo, (ATTN: Regulatory Functions Branch), 1776 Niagara Street, Buffalo, NY 14207, or by calling A/C 716, 876-5454, extension 2322.

CHAPTER ONE: PROJECT DESCRIPTION

THE APPLICANT

1.1
The applicant for this Department of the Army permit is the United States Steel Corporation, 600 Grant Street, Pittsburgh, Pennsylvania 15230. The locations and characteristics of existing plants owned and operated by the applicant are listed in Table 1-1.

1.2
The United States Steel Corporation engages in the manufacturing of steel, production of chemicals, resource development, fabrication and engineering services, transportation of goods and materials, and the operation of utilities. A brief description of each of these activities is presented below:

1.3
Steel Manufacturing - The applicant is one of the largest steel producing companies in the United States, contributing approximately 22 percent - 23 percent of the total domestic steel production of the United States. Raw steel production in 1977 was 26.15 million tonnes* (28.8 million tons) as compared to 25.7 million tonnes (28.3 million tons) in 1976, 24.0 million tonnes (26.4 million tons) in 1975, and 30.8 million tonnes (33.9 million tons) in 1974. In 1977, their capacity utilization rate was an average of 76 percent, ranging from 85 percent in the second quarter to 70 percent in the fourth quarter. Company-owned steel producing plants in Ohio, southwest Pennsylvania, and the Delaware Valley accounted for approximately 48 percent of their total raw steel production in 1977, while plants in the Chicago-Gary area, Alabama, Texas, Utah, and California, comprised the remaining 52 percent.

1.4
Chemicals - The U. S. Steel Corporation chemical division produces and markets various industrial and coal chemicals, polystyrene resins, and agricultural chemicals.

1.5
Resource Development - Resource development involves the operation of both domestic and foreign businesses which are either wholly or partially owned by the applicant. These include properties from which iron ore, coal, or other minerals are obtained, development of commercial outlets for currently owned resources which supply materials

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*One Tonne = 1,000 Kg = 1.1 tons

Table 1-1

Locations and Characteristics of Existing Steel Plants of the United States Steel Corporation

UNITED STATES STEEL CORPORATION

600 Grant Street, Pittsburgh, PA 15230
Incorporated Feb. 25, 1901 New Jersey (Predecessor)
Incorporated Sept. 10, 1965 Delaware.

Domestic Steel and Raw Material Operations

Eastern Steel Division
Central Steel Division
Western Steel Division
Raw Materials and Lake Shipping Division

General Divisions

American Bridge Division
Oilwell Division
United States Steel Products Division
United States Steel Supply Division
Universal Atlas Cement Division
USS Agri-Chemicals
USS Chemicals
USS Realty Development

Principal Subsidiaries

Alside, Inc.
Bessemer and Lake Erie Railroad Company
Birmingham Southern Railroad Company
Carnegie Natural Gas Company
Duluth, Missabe and Iron Range Railway Co.
Elgin, Joliet and Eastern Railway Co.
Navigen Company
Navios Corporation
Ohio Barge Line, Inc.
Percy Wilson Mortgage and Finance Corporation
The Pittsburgh & Conneaut Dock Company
Quebec Cartier Mining Company
Union Railroad Company
United States Steel International, Inc.
U.S. Steel Western Hemisphere, Inc.
USS Engineers and Consultants, Inc.
U.S. Steel Credit Corporation
Warrior & Gulf Navigation Company

Table 1-1 (Continued)

Financial

	Fiscal Years (millions of dollars)		
	1976	1975	1974
Total revenue................	$8,724.7	$8,380.3	$9,339.2
Stockholders' equity.........	5,129.0	4,850.2	4,436.8
Total assets.................	9,167.9	8,155.0	7,716.2

Plant Location	Plant Products
Eastern Steel Division	
Christy Park Works McKeesport, Pennsylvania	Forging shop
Clairton Works Clairton, Pennsylvania	Coke plant with ferromanganese blast furnace and rolling mills for structural shapes
Edgar Thomson - Irvin Works Braddock, Pennsylvania	Multi-plant integrated works; integrated from blast furnace to slab rolling mill
Dravosburg, Pennsylvania	Hot strip and cold strip rolling plant with finish coating of sheet and strip
Vandergrift, Pennsylvania	Sheet finish rolling shop
Fairless Works Fairless Hills, Pennsylvania	Fully integrated from coke plant to bar rod and wire, hot and cold-rolled strip with finish coating and skelp mill with pipe mills, wire, and rope department
Trenton, New Jersey.	Wire and rope department
Homestead Works	Multi-plant integrated works
Saxonburg, Pennsylvania	Sinter plant
Rankin, Pennsylvania	Blast furnace plant
Homestead, Pennsylvania	Steelmaking shop with plate mills and structural shape mills
McKees Rocks, Pennsylvania	Wheel and axle forging shop
Johnstown - Canton Works Johnstown, Pennsylvania	Specialty steel arc furnace foundry, forge fabrication and roll shop
Canton, Ohio	Cast iron roll foundry

Table 1-1 (Continued)

Plant Location	Plant Products
Lorain - Cuyahoga Works Lorain, Ohio	Multi-plant integrated works integrated from coke plant to steel bar mills and pipe mills
Cleveland, Ohio	Blast furnace plant
Cleveland, Ohio	Bar, rod, and wire mills and hot and cold strip mills
National - Duquesne Works Duquesne, Pennsylvania	Multi-plant integrated works, integrated from blast furnaces to specialty steel blooms, billets, and bar with bar finishing
McKeesport, Pennsylvania	Blast furnaces with blooming mills, bar mills, and pipe mills
New Haven Works New Haven, Connecticut	Wire drawing and finishing shop
Youngstown Works Youngstown, Ohio	Integrated plant from blast furnaces to bar mills and hot strip and cold strip mills
Fairfield Works Fairfield, Alabama	Fully integrated from coke plant to rail mill, structural mill, bar mill, plate mill, hot strip and cold strip mills with finish strip coating, wire mill with wire products, and forging shop for railway products
Texas Works Baytown, Texas	Steelmaking shop with arc melting, plate, and pipe mills
Central Steel Division	
Duluth Works Duluth, Minnesota	Coke plant
Gary Works Gary Indiana	Fully integrated from coke plant to rail mill, bar mills, hot strip and cold strip mills with finish coating of sheet and strip, and forging shop
USS Tubing Specialties Gary, Indiana	Tube mill shop

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Table 1-1 (Continued)

Plant Location	Plant Products
Joliet - Waukegan Works Joliet, Illinois	Multi-plant wire works; rod mills, wire mills, and wire products
Waukegan, Illinois	Wire drawing shop
South Works S. Chicago, Ilinois	Integrated plant from blast furnaces to specialty steel structural mills, bar mill, rod mill, and plate mills
Western Steel Division	
Geneva Works Geneva, Utah	Fully integrated from coke plant to structural mill and plate and hot strip mill with pipe weld mills
Pittsburg Works Pittsburg, California	Rolling and finishing shop with rod mill, cold strip mills, and finish strip coating, wire mill with wire products, and pipe galvanizing
Torrance Works Torrance, California	Steelmaking shop with light structural mill and bar mill

Coal

Coal mines and preparation plants in Pennsylvania, West Virginia, Kentucky, Alabama, Utah, and Colorado (mine only).

Limestone and Dolomite

Quarries and sizing plants in Michigan, West Virginia, Alabama and Utah. Processing plants in New York and Ohio.

Iron Ore

Mines, sizing and beneficiation plants in Minnesota, Wyoming and Utah. Subsidiary has mines in Canada.

Other

Iron ore agglomerating facilities in Minnesota and Wyoming. Subsidiary has agglomerating facilities in Canada.

Zinc ore mine and concentrating plant in Tennessee.

Lake Shipping

A fleet of bulk cargo vessels is operated on the Great Lakes and St. Lawrence Seaway.

Source: Arthur D. Little, Inc., modified from American Iron and Steel Institute and United States Steel Corporation.

in excess of corporate consumption; and mineral resource exploration and development.

1.6
At the present time, the corporation owns or leases domestic coal properties with approximately 3.08 billion net tonnes (3.4 billion tons) of proven and probable reserves of coal, including 2.63 billion net tonnes (2.9 billion tons) of bituminous coal and .45 billion net tonnes (.5 billion tons) of lignite. Approximately 19 percent of the bituminous coal is located in Alabama, 28 percent in Kentucky and West Virginia, 26 percent in Illinois and Indiana, 20 percent in Pennsylvania, and the remaining coal in Colorado, Tennessee, Utah, and Virginia. All of the lignite reserves are located in Montana.

1.7
The applicant owns or leases limestone properties in Michigan, Pennsylvania, and other States, and dolomitic limestone properties in Alabama, Michigan, Ohio, West Virginia and other States. The proven and probable limestone and dolomitic limestone reserves are estimated to total approximately 3.0 billion net tonnes (3.3 billion tons).

1.8
In addition, the U. S. Steel Corporation owns or leases domestic iron ore properties with proven and probable reserve capable of producing approximately 3.8 billion net tonnes (4.2 billion tons) of product. Most of the ore is in iron ore concentrates produced from taconite, a low-grade iron-bearing material. Approximately 84 percent of this iron ore is located in the Lake Superior area with the remaining 16 percent in the western States and Alaska.

1.9
Fabrication and Engineering Services - This division is responsible for the fabrication and erection of structural steel for buildings, bridges, and storage tanks, as well as the fabrication of barges, ship sections, transmission towers, large diameter pipe, gas and oil field drilling and pumping equipment, shipping containers, electrical cable, residential housing products, and the production of cement. Other services provided by this division include the areas of engineering and consulting, real estate and finance.

1.10
Domestic Transportation and Utility Subsidiaries - Facilities in this category owned domestic common carrier railroads and barge lines which transport materials and products for the applicant as well as the general public. Gas utility companies are also a part of this division.

Table 1-2

Major Projects in Steel Manufacturing Operations and Year of Start-up of Operation

1975

Mt. Wright Iron Ore - 20 million tons - Canada
Coke Oven Battery No. 2 - 0.9 million tons - Gary, IN
Rehabilitate Nos. 16-17 Coke Oven Batteries - Clairton, PA
100-Ton Electric Furnace - Chicago, IL
Billet Conditioning Facilities - Chicago, IL
Modernize No. 1 Rod Mill - Cleveland, OH
Coke Oven Gas Desulfurization Facilities - Clairton, PA
Waste Water Treatment Facilities - Clairton, PA
Air Quality Control Facilities - Rail, Slab and Billet Mills - Gary, IN

1976

Expanded Capacity of Coal Mine & Corbin Preparation Plant - 1.6 million tons - Lyncy, KY
Coke Oven Battery - 0.9 million tons - Gary, IN
Coke Plant Air Pollution Abatement Facilities - Gary, IN
Additional Water Quality Control Facilities - Chicago, IL
Increased Billet Capacity - Provo, UT
Improvements to 80-inch Hot Strip Mill - Gary, IN

1977

Two Electric Furnaces, Two Slab Casters and Plate Mill Facilities - Baytown, TX
48-inch Diameter Line Pipe Mill - Baytown, TX
One-Side Electrogalvanizing Facilities - Gary, IN
Rehabilitated Coke Battery - Gary, IN
Rehabilitated Coke Battery - Lorain, OH
Rehabilitated Coke Battery - Clairton, PA
Rehabilitated Two Coke Batteries - Fairless Hills, PA
Rebuilt and Enlarged Blast Furnace - Braddock, PA (Edgar Thomson Works)

Source: Annual Reports of United States Steel Corporation for 1975, 1976, 1977

Table 1-3

Expected Year of Initial Operation of Major Steel Manufacturing Projects Under Construction

1978

Taconite Expansion - 6.7 million tons - Minnesota
Laminar Flow cooling 84-inch Hot Strip Mill - Gary, IN
Additional Coke Oven Gas Processing Facilities - Gary, IN
Water Quality Control Facilities - Dravosburg, PA (Irvin Works)
Air Quality Control Facilities - Dravosburg, PA (Irvin Works)
Blast Furnace - 5,000 Tons/Day - Fairfield, AL
200-Ton Q-BOP Furnace - Fairfield, AL
Coke Oven Battery - 0.9 million tons - Fairfield, AL
Rehabilitation of Coke Battery - Fairfield, AL
Coal Mine - 0.5 million tons - Shelby County, AL
Boiler Emission Control Facilities - Provo, UT
Rehabilitation of Coke Battery - Lorain, OH

1979

Rehabilitation of Coke Battery - Clairton, PA
Rehabilitation of Coke Battery - Gary, IN
Water Quality Control Facilities - Gary, IN
Water Quality Control Facilities - Braddock, PA (Edgar Thomson Works)
Two 1,000-Foot Long Vessels - Great Lakes Fleet

1980

Water Quality Control Facilities - Braddock, PA (Edgar Thomson Works)
Water Quality Control Facilities - Dravosburg, PA (Irvin Works)
Water Quality Control Facilities - Duquesne, PA

Source: 1977 Annual Report, United States Steel Corporation

RECENT INVESTMENTS BY UNITED STATES STEEL CORPORATION

1.11
Major commitments have been made on the part of the United States Steel Corporation to upgrade its position in the domestic steel market. In this regard the corporation has invested funds to upgrade existing facilities, obtain new equipment, and achieve compliance with Government regulations. For example, expenditures during the years 1975, 1976, and 1977 amounted to 787 million, 957 million, and 865 million respectively.

PURPOSE OF THE PROPOSED FACILITY

1.12
The proposed steel plant will increase steelmaking capacity of the United States Steel Corporation by 5.8 million tonnes (6.4 million tons). The projected plant output of 4.45 million tonnes (4.9 million tons) of hot rolled steel sheets and coils will allow the applicant to increase its share of this market and better utilize excess cold finishing capacity within the product market area. Production of an estimated 1.38 million tonnes (1.52 million tons) of steel plate will increase the applicant's share of the local market and help maintain its overall position in the national market as heavy construction demand increases.

DETERMINATION OF THE NEED FOR THE PROPOSED FACILITY AND METHODOLOGY FOR SITE SELECTION

1.13
Determination of the need for a new steelmaking facility and selection of a suitable plant site is a complex process which requires collective evaluation of a variety of factors. To determine the need for the proposed steel mill the applicant evaluated past and present demand patterns for the steel industry as a whole in order to project future market trends. This information was then broken down further in order to project future demand for individual steel product classifications. Geographical limits were then determined for the product lines which exhibited the best growth potential. Once all of these factors are known, a general region can be identified in which construction and operation of a new steel mill would be most practical. Factors such as land availability, water supply, transportation infrastructure, labor availability, and raw materials assembly costs were then considered by the applicant in arriving at a specific location for the proposed steel mill. The applicant's findings relative to need and site selection are presented below:

1.14
Steel Demand - Steel demand is normally reported in terms of raw steel produced and finished steel shipped. In 1976, a depressed year

in which demand was about 10 percent below the long term trend, the United States produced about 116 million tonnes (128 million tons) of raw steel and shipped about 81.5 million tonnes (90 million tons) of finished steel. In addition, net imports (imports minus exports) of approximately 10.5 million tonnes (11.5 million tons) were supplied so that total demand during this period was approximately 92 million tonnes (101 million tons) of finished steel.

1.15
The applicant has determined that additional steelmaking capacity within their corporation is necessary to maintain their current share of the domestic market. The domestic steel industry has been experiencing a growth of 2-2.5 percent per year from the early 1950's to 1977 and most industry forecasts project continued growth within this range based on the following assumptions:

- little growth in steel usage for personal transportation (automobiles) but an average growth in overall transportation at 2.5 percent per year;
- energy markets at 2.6 percent per year;
- industrial, construction, and electrical machinery at 3.2 percent per year;
- construction at 2.2 percent per year;
- containers at 1.6 percent per year;
- appliances up slightly; and
- agricultural and ordnance, no growth

The applicant has reported that using these assumptions, an additional 23-27 million tonnes (25-30 million tons) of raw steel capacity will be required to supply normal cyclic fluctuations in the domestic steel market by 1985 (1-1). A survey conducted in 1977 among the members of the American Iron and Steel Institute (AISI) indicated approximately 16.3 million tonnes (18 million tons) of capacity can be added by roundouts at existing plant locations and that the remaining 10.9 million tonnes (12 million tons) needed will require a full complement of facilities, including raw material and transportation support facilities, at either greenfield sites or at existing manufacturing locations, known as Brownfield sites.

1.16
Analysis and Identification of Product Line - Selection of a product line for a new steelmaking facility and forecasts for future demand

can be ascertained through the study of steel commodity shipping patterns. AISI lists steel production information in Table 1-4 for 43 different manufacturing categories during the years 1973-1976. These data may be considered representative of product shipping patterns since it includes two years of peak production (1973-1974) as well as two years of below normal activity (1975-1976). During this period, light flat rolled products (including all sheet, strip, and tinmill products) represented 50 percent of the total tonnage of steel shipped while steel plate amounted to nine percent. Utilizing the growth rate data of 2.0-2.5 percent per year, the applicant predicts that industrywide raw steelmaking capacity in these two product areas will increase 13.5-16.5 million tonnes (15-18 million tons) by 1985. The applicant has concluded from this analysis that additional steelmaking capacity should be directed toward the manufacture of hot rolled steel sheet and steel plate products.

1.17
Determination of Market Areas - The applicant continued the analysis by studying the potential product markets for hot rolled steel sheet and steel plate manufactured at a new steelmaking facility. Their studies indicate that a significant proportion of the plant output could be directed to finishing facilities within the corporation while the remainder would be utilized by private interests within the Great Lakes Basin. Therefore, proximity to both interplant finishing facilities as well as the general product market were key factors in the plant siting process.

1.18
The applicant projects that approximately 40 percent of the hot rolled coils or 1.73 million tonnes (1.9 million tons) of product from the new facility will be shipped to other nearby finishing mills within the corporation for further processing into cold rolled and coated steel products. The increased steel tonnage delivered to these facilities will not create an overload situation since finishing mills have capacities far greater than exist for raw steel production within the corporation. The applicant, during his examination of the private sector requirements for this product line, found that 70-80 percent of the market for steel sheet and 45 percent of the market for steel plate existed in those States bordering the Great Lakes basin. Therefore, prime consideration was given to locating the new steelmaking facility on the Great Lakes.

1.19
Site Specific Factors - Factors considered by the applicant in the selection of a site for a new steel mill include: availability of land, access to a deepwater port, adequate water supply for plant process units and cooling, labor availability, adequate transportation infrastructure, costs of acquiring and developing raw

Table 1-4

U.S. Net Shipments of Steel Products from Domestic Mills
(Thousands of Tons)

Steel Products	1976		1975		1974		1973	
	Shipments	%	Shipments	%	Shipments	%	Shipments	%
Ingots and steel castings	488	0.6	559	0.7	684	0.5	614	0.6
Blooms, slabs, billets, sheet bars	1,967	2.2	2,020	2.5	2,937	2.7	3,095	2.8
Tube rounds	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
Skelp	28	...	34	0.1	27	...	....	...
Wire rods	1,901	2.1	1,298	1.6	1,861	1.7	2,040	1.8
Structural shapes (heavy)	3,857	4.3	4,697	5.9	6,548	6.0	6,556	5.9
Steel piling	330	0.4	424	0.5	662	0.6	525	0.5
Plates	7,160	8.0	8,761	11.0	10,919	10.0	9,678	8.7
Rails-Standard (over 60 lbs.)	1,303	1.5	1,179	1.5	924	0.8	916	0.8
-All other	37	...	70	0.1	66	0.1	51	...
Joint bars	19	...	29	...	30	...	21	...
Tie plates	250	0.3	222	0.3	269	0.2	216	0.2
Track spikes	105	0.1	88	0.1	88	0.1	86	0.1
Wheels (rolled and forged)	175	0.2	216	0.2	221	0.2	240	0.2
Axles	128	0.2	161	0.2	187	0.2	159	0.1
Bars-Hot rolled	7,822	8.8	7,410	9.3	10,08[illegible]	9.2	9,7[illegible]3	8.7
-Bar-Size light shapes	842	0.9	736	0.9	982	0.9	1,034	0.9
-Reinforcing	3,876	4.3	8,666	4.6	5,089	4.6	5,135	4.6
-Cold finished	1,618	1.8	1,486	1.8	2,250	2.1	2,161	1.9
Tool steel	76	0.1	69	0.1	113	0.1	111	0.1
Pipe and tubing-Standard	1,782	2.0	2,096	2.6	2,918	2.6	2,979	2.7
-Oil country goods	1,678	1.9	2,577	3.2	2,262	2.1	1,736	1.6
-Line	1,019	1.1	1,721	2.2	2,373	2.2	2,008	1.8
-Mechanical	1,260	1.4	1,202	1.5	1,503	1.4	1,585	1.4
-Pressure	197	0.2	322	0.4	324	0.3	241	0.2
-Structural	208	0.3	258	0.3	411	0.4	548	0.5
-Stainless	31	0.1	42	0.1	53	...	36	...
Wire-Drawn	1,921	2.1	1,625	2.0	2,527	2.3	2,559	2.3
-Nails and staples	281	0.3	265	0.3	332	0.3	362	0.3
-Barbed and twisted	71	0.1	81	0.1	68	0.1	90	0.1
-Woven wire fence	134	0.1	124	0.2	128	0.1	134	0.1
-Bale ties and bailing wire	54	0.1	59	0.1	117	0.1	100	0.1
Black plate	614	0.7	486	0.6	701	0.6	694	0.6
Tin plate-Electrolytic and Hot dipped	4,784	5.3	4,151	5.2	5,549	5.1	5,288	4.7
Tin Free Steel	967	1.1	1,000	1.2	1,211	1.1	1,243	1.1
Tin Mill products-All other	71	0.1	50	0.1	67	0.1	91	0.1
Sheets-Hot rolled	15,090	16.9	11,222	14.1	15,774	14.1	16,885	15.2
-Cold rolled	18,265	20.4	12,841	16.1	18,275	16.7	20,377	18.3
Sheets and strip-Galvanized-Hot dipped	4,914	5.5	3,537	4.4	5,772	5.3	6,515	5.9
-Electrolytic	265	0.3	183	0.2	333	0.3	371	0.3
-All other metallic coated	844	0.9	555	0.7	998	0.9	947	0.9
-Electrical	577	0.7	563	0.7	859	0.8	862	0.8
Strip-Hot rolled	1,196	1.3	961	1.2	1,405	1.3	1,869	1.7
-Cold rolled	1,152	1.3	901	1.1	1,575	1.4	1,543	1.4
TOTAL STEEL PRODUCTS	89,447	100.0	89,957	100.0	109,472	100.0	111,430	100.0
Carbon	80,320	89.8	80,764	88.5	97,948	89.5	100,924	90.8
Stainless and heat resisting	1,019	1.1	757	0.9	1,345	1.2	1,134	1.0
Alloy (other than stainless)	8,108	9.1	8,486	10.6	10,179	9.3	9,372	8.4

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[1] Included with blooms, slabs, billets, sheet bars and hot rolled bars.

Source: Annual Statistical Report, American Iron and Steel Institute, 1976.

materials storage facilities, and assembly costs for raw materials. The site bordering Lake Erie to the east of Conneaut Harbor, OH was selected because rail, highway, and transportation corridors adequately service the area; the site was accessible to a deepwater harbor and Lake Erie; and the plant could be supported by the Pittsburgh and Conneaut Dock Company, a recently modernized raw materials storage and handling facility which is a wholly owned subsidiary of the United States Steel Corporation. The applicant has also found the geographic location of the site to be nearly ideal in terms of the product markets that could be served.

DESCRIPTION OF THE PROPOSED PLANT

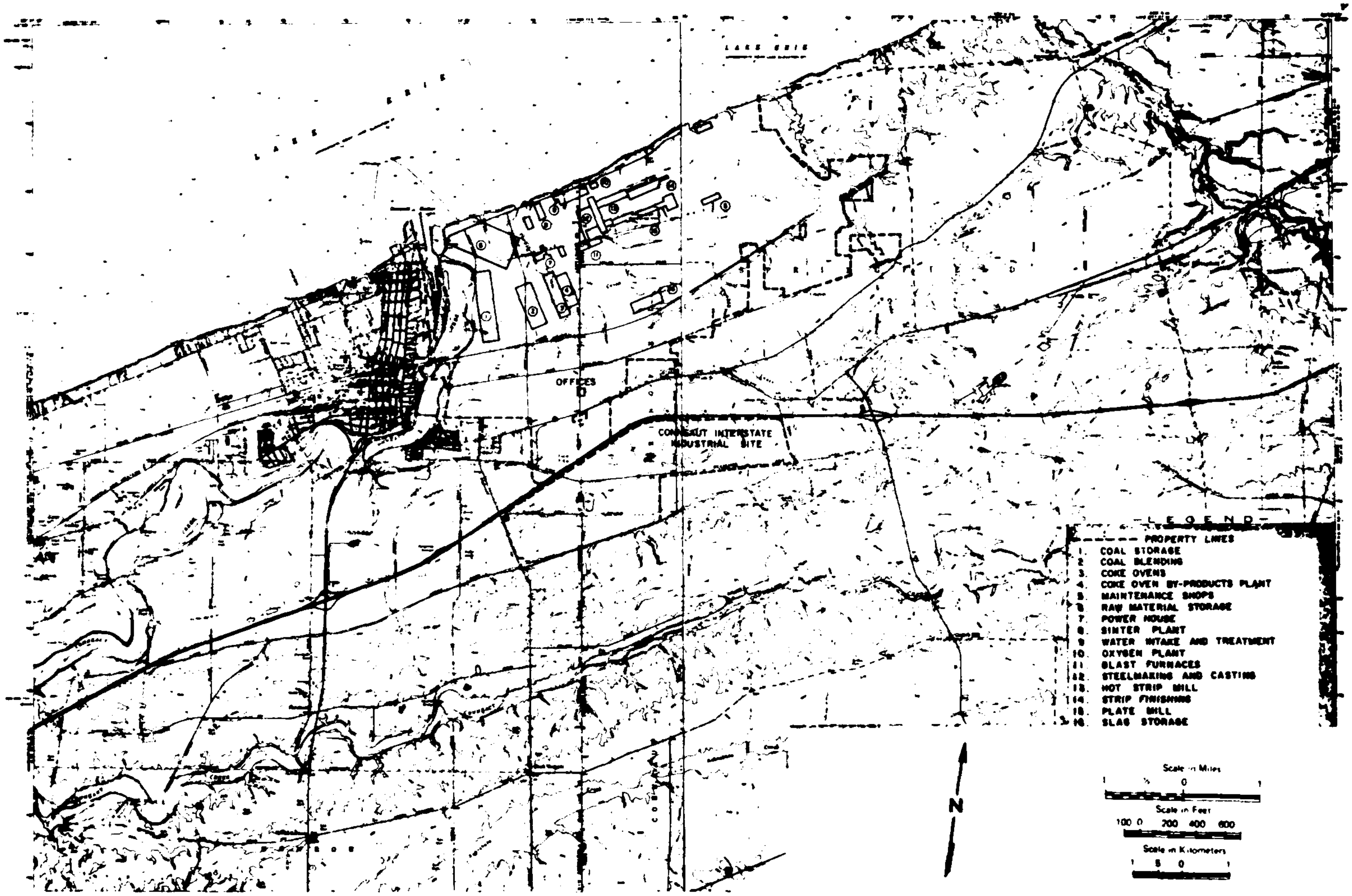
Principal Features of the Proposed Plant

1.20
The Lakefront Plant is proposed to be a fully integrated steel plant that will utilize as basic raw materials coal, iron ore, and limestone. The plant will convert coal to coke for smelting the iron ore to molten iron. Iron will then be refined to molten steel which will be cast into solid form and rolled into product shapes.

1.21
The geographic relationships of individual plant process units to one another is shown in Figure 1-1. The raw materials, consisting of iron ore, coal, and limestone, will be shipped from existing mining facilities and received at the western side of the area. Nearest to the receiving and storage area will be the facilities for processing the raw materials: a coke plant for production of coke, a lime plant for calcining limestone, and a sinter plant for aggregating iron ore fines and recycled iron-bearing dusts and sludges. These process units will join with ironmaking and steelmaking facilities to the east. The steel will be continuously cast into slabs for subsequent rolling either to sheet and strip in a hot strip mill or to plate in a plate mill. Finished mill products will arrive at the eastern end of the plant where they will be shipped to various points throughout the market area. The movement of materials through the proposed mill is shown in Figure 1-2.

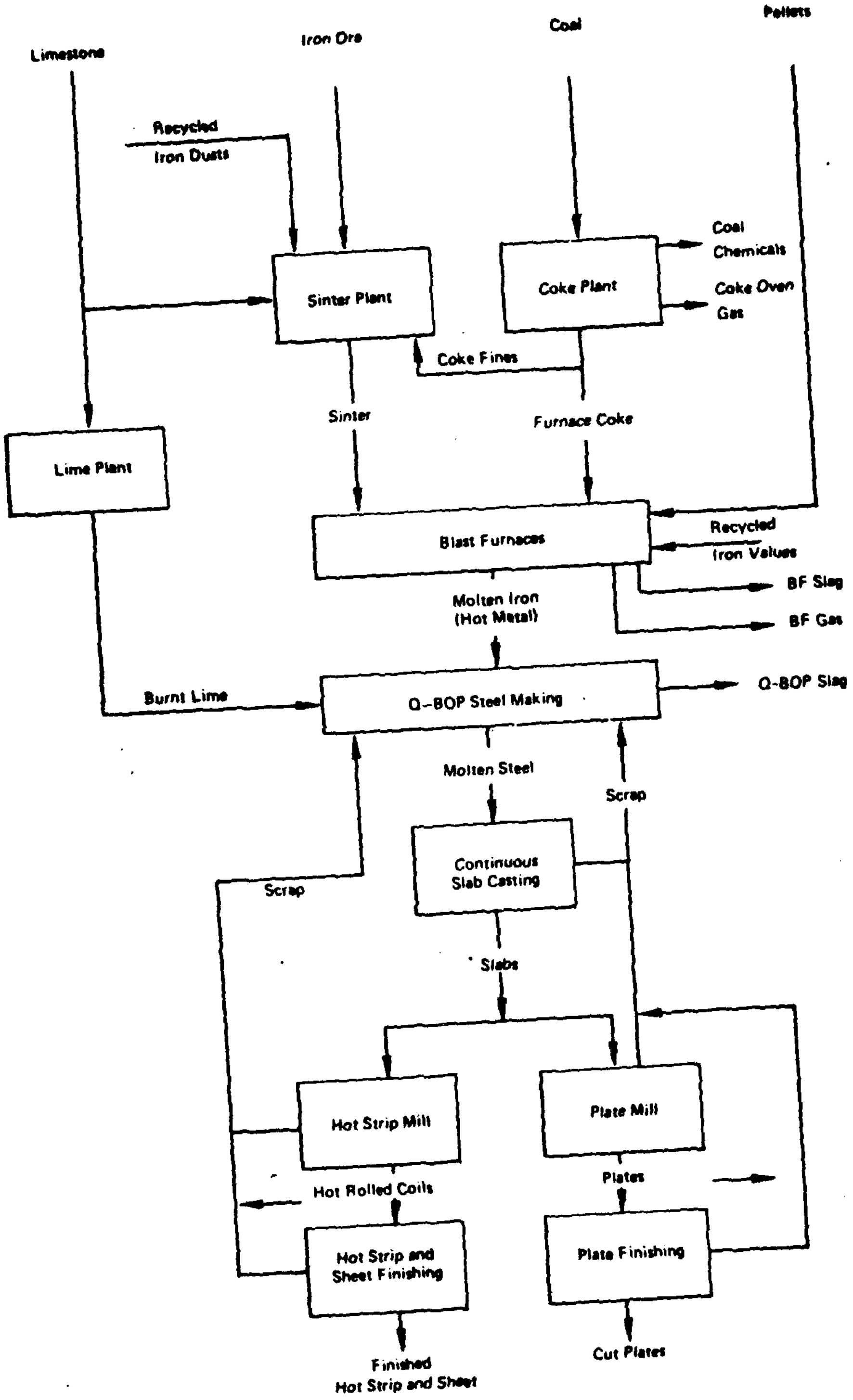
Location and External Appearance of the Proposed Plant

1.22
The site of the proposed Lakefront Plant is located along the southern shore of Lake Erie about one mile to the east of Conneaut, Ashtabula County, OH, and extends easterly about three miles across the State line into Springfield Township, Erie County, PA. It extends south from Lake Erie about 1.5 miles and is generally bounded on the east by Elmwood Road, the south by a railroad corridor owned



Source: United States Steel Corporation.

FIGURE 1–1 PROPOSED LAKEFRONT PLANT SITE MAP



Source: Arthur D. Little, Inc.

FIGURE 1–2 FLOW SHEET OF PROCESS OPERATIONS

by Conrail, and the west by Conneaut Harbor. The overall area of the proposed site is approximately 2,800 acres.

1.23
The proposed plant will occupy about 1,300 acres of the overall site. The plant area will be bounded on the west by the raw material handling and storage facilities of The Pittsburgh and Conneaut Dock Company, on the south by land predominantly owned by the Bessemer and Lake Erie (B&LE) Railroad or Conrail, and on the east by Raccoon Park. To the south of the site, there are two major east-west highways, Routes 20 and I-90. The dimensions of the area to be occupied by the proposed plant are somewhat more than two miles east to west and one mile north to south. The terrain itself consists of slightly rolling land covered with secondary growth vegetation. There are no outstanding topographic features in the site that would be visible beyond the applicant's property line.

1.24
To an observer passing along Route 30, south of the site, the most prominent features presented by the proposed plant will be the stacks of the coke batteries and the tops of the blast furnaces. The coke battery stacks, which will be nearest to the highway, will be about 100 meters (328 ft.) high and 1.6 kilometers (one mile) from the highway, subtending an angle of 3.6° from the road. The angle subtended by the blast furnace tops, which will be about 90 meters (295 ft.) high and about 0.5 kilometer (0.3 mile) further from the highway, will be about 2.5°. Thus, the coke plant and blast furnace stacks will subtend shallow angles from the horizon of only 3.6° and 2.5°, respectively, to the passing observers. Other plant facilities, which will generally be further away from the highway than either the coke batteries or the blast furnaces, will also have much lower roof lines, ranging from 20 meters (66 ft.) up to 45 meters (148 ft.) and with isolated exhaust stacks of 50 meters (164 ft.) or 75 meters (246 ft.) in height. Thus, these facilities will subtend much smaller angles on the horizon to the passing observer. The largest building planned for the site will extend about 1.5 kilometers (0.9 miles) east-west, essentially parallel to Route 20, and will be between 2.0 and 2.5 kilometers (1.2 and 1.5 miles) away from the road. The roof height will range from 45 meters (148 ft.) at the west down to 22.5 meters (74 ft.) at the east end. Thus, from the highway, even for direct line-of-sight, this building would present a relatively low and unobtrusive profile on the horizon to any passing observer.

Plant Layout

Process Operations

1.25
The planned product mix of the proposed plant is composed of hot-rolled strip and plate. The manufacture of these products at the rates appropriate to their intended quantities of shipment from the plant has essentially dictated the scale of the process operations and equipment required to meet the shipment schedule. The planned process facilities and their physical relationship to each other are shown on the plot plan of Figure 1-3. Superimposed on the plot plan is a grid with line spacings of 300 meters (330 yards) and 200 meters (20 yards) in the east-west and north-south orientations, respectively. Using this grid, the nominal space requirements of the facilities and the distances between them can be readily estimated.

1.26
The shipment of the planned product mix of 5.8 million tonnes (6.4 million tons) of finished strip and sheet and plate requires that the final operation consist of cutting and trimming operations appropriate for finishing these products to specification. The operations upstream of the product finishing and shipping department are a hot strip rolling mill, to produce coils of extended continuous lengths from thick slabs and a hot plate mill, to roll thick slabs to desired plate thicknesses to meet customer requirements. Thus, either product is to be rolled from the common intermediate slab section although the slabs would differ according to their end use.

1.27
Present economics of steelmaking require that the slabs for subsequent rolling be cast from molten steel in continuous strands rather than in discrete ingots. Ingots entail more extensive handling and metalworking and incur higher crop losses. Therefore, more raw steel in the form of ingots would be consumed to produce the same quantity of slabs that the proposed plant will obtain from continuous casting. Molten steel, in turn, is to be produced by the bottom blown oxygen steelmaking practice developed by U.S. Steel. Steel will be made from refining molten pig iron and in-plant scrap with the addition of burnt lime. Burnt lime will be produced on-site by calcining limestone. Molten pig iron will be smelted with coke in blast furnaces from prepared iron ore sinter and direct shipped iron ore pellets. Coke serves as both source of fuel and chemical reductant and will be made by the carbonization or destructive distillation of blended metallurgical grade coals in batteries of byproduct ovens. Iron ore is sintered along with iron-bearing dusts and sludges recycled from the environmental control systems. The sintering process causes the iron units blended together with limestone

in the feed to aggregate into fluxed sinter which is crushed to sizes suitable for charging to the blast furnace.

1.28
A major consideration for a steel plant layout is the magnitude of the materials to be received, handled, transferred and processed to obtain a finished ton of steel product. Plans for the proposed plant call for plate product mix. The product mix will entail the consumption of 7.1 million tonnes (7.8 million tons) of pellets, 2.6 million tonnes (2.8 million tons) of ore, 1.3 million tonnes (1.4 million tons) of limestone and up to 5.5 million tonnes (6.0 million tons) of coals and oil, for a total of 16.5 million tonnes (18.2 million tons) of primary raw materials as well as additional fuel supplies averaging 400,000 tonnes (440,000 tons) for the basic process operations and steam generation. Thus, each tonne of steel product will have required the consumption of almost 2.8 tonnes (3.1 tons) of raw materials. This material consumption requires an annual average rate of delivering, stocking, and transfer of 1,850 tonnes (2035 tons) per hour.

1.29
Thus, the plans for the proposed project have provided for the requisite storage capacity by expansion of the raw material stockyards located along the east bank of Conneaut Harbor where the Pittsburgh & Conneaut Dock Company (P&C) already operates a receiving and storage site for the transshipment of water-borne ore to inland steel plants by rail and rail-borne coal from inland mines by ship for export to Canadian consumers, as well as to other domestic consumers. The raw material stockpiles are to be located adjacent to Conneaut Harbor to the west of Turkey Creek with the iron ore and limestone stockyard to be at the north, while the coal stockyard is to be at the south of the storage area (refer to Figure 1-3). The existing P&C facilities are to be expanded to accommodate the raw materials requirements for the proposed facilities.

1.30
Each of the three principal raw materials for the plant (iron ore, limestone and coal) must be independently processed to convert it to a form suitable for future use. Efficient flow of materials dictates that the individual raw material process operations be located as close as possible to their respective stockpiles. Modern iron ore technology beneficiates low grade natural ores to enriched pellets, which have sufficient mass, structural integrity, and a hardened surface to resist fracture and abrasion. This enables them to be shipped and charged to blast furnaces without degradation. The major proportion (about 75 percent) of the iron units received by the plant will be in the form of pellets. The balance of the iron units will

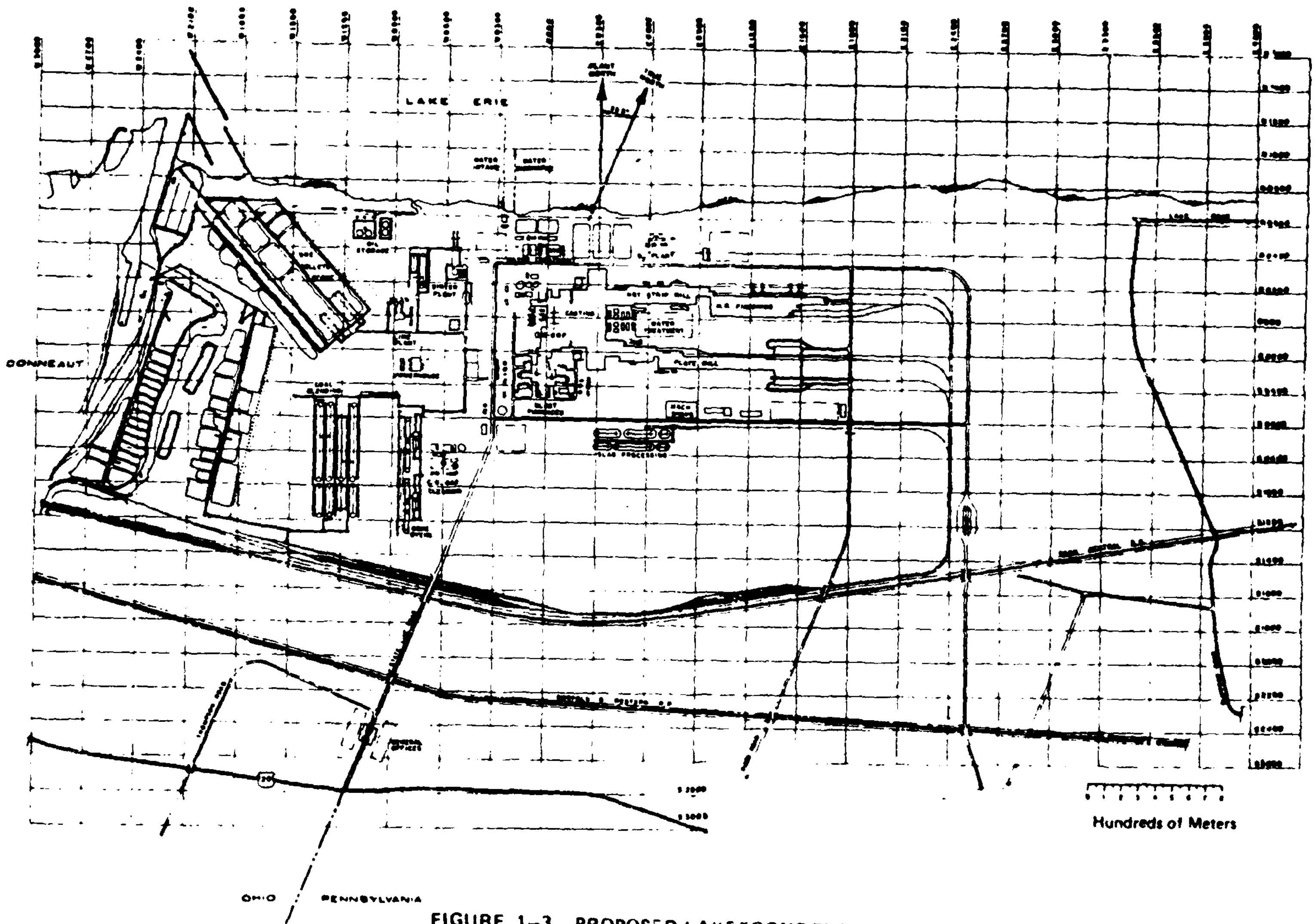


FIGURE 1-3 PROPOSED LAKEFRONT PLANT LAYOUT

be provided in the form of ore suitable for agglomeration by sintering in an onsite sinter plant. Flow-of-material considerations dictate that the distance between the ore stockpile and the sinter plant be minimal. The proposed plan is for the sinter plant to be located about 0.5 kilometer (550 yards) to the east of the ore stockpile reclaim station.

1.31
The principal consumption of the limestone is calcined or burnt lime for slag formation in steelmaking. The calcination is accomplished by heating the limestone to high temperatures in lime kilns. Undersize limestone, screened from the lime kiln feed, is sent to the sinter plant for incorporation with the agglomerated iron ore and accounts for the rest of the limestone consumption. Limestone for fluxing the ironmaking process is thus charged to the blast furnace as a constituent of the basic self-fluxing sinter. Material flow and handling thus dictate that the lime plant should be close to the limestone stockpile in the ore yard and the sinter plant. For these reasons, the lime plant is located between the ore pile reclaim station and the sinter plant.

1.32
The third principal raw material needed by an integrated steel plant is furnace coke for charging to the blast furnace. In all major modern steel plants, furnace coke is made by coking selected grades of metallurgical coal. The coal for coking and some steam coal for boiler fuel use is to be supplied by rail to The Pittsburgh and Conneaut Dock Company (P&C) coal yard area. The proposed plan calls for the coal to be delivered to the P&C coal receiving station located between the export coal storage area of P&C and the area required for stocking and bed blending the metallurgical coal for the coke plant. Thus, the coal receiving station would be at the southern end and to the east of the raw materials storage area. The coke plant coal bed blending area will be located east and north of the coal receiving station to the west of Turkey Creek. Again, the flow of materials governs coal handling and conveying so that the coke plant, as the next process step, should be located adjacent to the bed blending area. A by-product coal chemicals plant for extracting the condensible hydrocarbons and chemicals from the coke oven gas (COG) evolved from the coal during coking is the adjunct of the coke plant and is located with the latter. In addition, the COG is to be desulfurized at the by-product plant and the clean coke oven gas distributed back to the coke ovens and throughout the plant as a primary calorific rich fuel. The coke oven gas is the principal fuel for the lime plant and the sinter plant, which is the reason for locating these three operations in close proximity, thus minimizing piping requirement for the flow of the COG. Thus, the sinter plant, lime plant, and coke plant constitute a related group of raw

materials processing units, operating between the raw materials storage stockpiles and the downstream process operations which are to be located further to the east.

1.33
From the raw materials processing operations, the processed raw materials are sent to the blast furnace stockhouses by conveyor from the respective process operation. For optimization of these flows of materials, the blast furnaces have been located as close as possible to the east of the preceding operations. The blast furnace cast houses have been conceived as a totally enclosed design with the molten iron product being tapped into covered runners on an almost continuous basis. In a departure from conventional practice, the hot metal will be tapped into open ladles which are to be kept under roof for transfer to the abutting steelmaking shop. Thus, the plant will not utilize the exposed hot metal torpedo car rail transport system commonly observed at existing steel plants needed to haul the hot metal between separated operations.

1.34
To minimize internal transport for the hot metal transfer, the steelmaking shop will be north of and adjoining the blast furnace buildings. At the steelmaking shop, the hot metal together with recycle scrap, recovered from the in-plant cropping, cutting, and trimming operations, is charged to the steelmaking furnaces in batch quantities of about 330 tonnes (360 tons) per heat. The refined molten steel is then transferred under roof in open ladles to the continuous casting shop which abuts the steel shop on its east side. The steel will be solidified at the continuous casters into extended lengths of slabs suitable for rolling to strip in the hot strip mill or to plate in the plate mill. The as-cast strands exit from the casting machines at red heat temperatures along run-out tables to the east. For energy conservation, the hot strand is to be sent directly to the rolling mills with minimum delay whenever possible. To realize this material flow and energy conservation, the run-out from the caster is kept under roof. The moving strand is cut to slab lengths for rolling. Slabs are sent directly to the reheat furnaces for the stripmill or the plate mill or to slab holding areas. The buildings for the hot strip and plate mills extend in parallel to the east from the casting building. The hot strip mill building is to the north and the plate mill to the south with about 200 meters (660 ft.) between them. The stripmill building extends about 1,300 meters (4,300 ft.) and the plate mill about 1,100 meters (3,600 ft.). The space between the mill buildings will be used for the water treatment system for the steel mill operations. Shipments of finished product will be made by truck and rail from the easterly ends of the mill buildings.

Site Development Considerations

1.35
The preferred layout of the plant facilities, as discussed in the preceding section, has been based on optimizing the flow of materials between process operations. As shown in Figure 1-4, several process units are located along portions of Turkey Creek and its banks. The facilities installed to the west side of the creek include the iron ore and pellet storage pile and its underground reclaim station, the coke plant and its coal blending beds, and the oil storage tanks area. Those to the east of the creek include the coke by-product plant, the lime plant, the blending piles for the sinter plant and the powerhouse. In addition space must be provided around each facility to deliver or remove process materials, unload and remove dust or sludges collected by pollution control equipment, and for the maintenance and service vehicles. All needed spaces must be filled, leveled, and graded for drainage and collection of storm runoff. Thus, the placement of culverts in this portion of Turkey Creek will be necessary to construct, operate, and maintain these process units.

Plant Facilities and Process Operations

Raw Materials Handling and Storage

1.36
Raw materials (iron ore, pellets, limestone, dolomite, metallurgical grade coal, and steam coal) for the proposed plant will be supplied from The P&C Dock Company, a subsidiary of the United States Steel Corporation.

a) Marine Receiving Facilities

1.37
The P&C facilities are located in Ohio adjacent to the northwest corner of the site for the proposed facility. P&C will receive shiploads of iron ore, pellets, and limestone through the Great Lakes: pellets in 14,000-to 60,000-tonne (15,400- to 66,000-ton) shipload sizes from Minnesota and Michigan mines; ore in 14,000-to 28,000-tonne (15,400-to 30,800-ton) shipments from the Minnesota, Labrador and Quebec mines and limestone in 14,000- to 32,000-tonne (15,400- to 35,200-ton) vessels from Michigan. P&C dock facilities in 1977 will have handled about 279 shiploads of iron ore and pellets totalling 6.6 million tonnes (7.2 million tons), and 70 shiploads of limestone totalling about 1.43 million tonnes (1.57 million tons). Includes limestone received by U.S. Steel Raw Materials Division.

b) Expansion of Existing Docking Facilities (Department of the Army permit required)

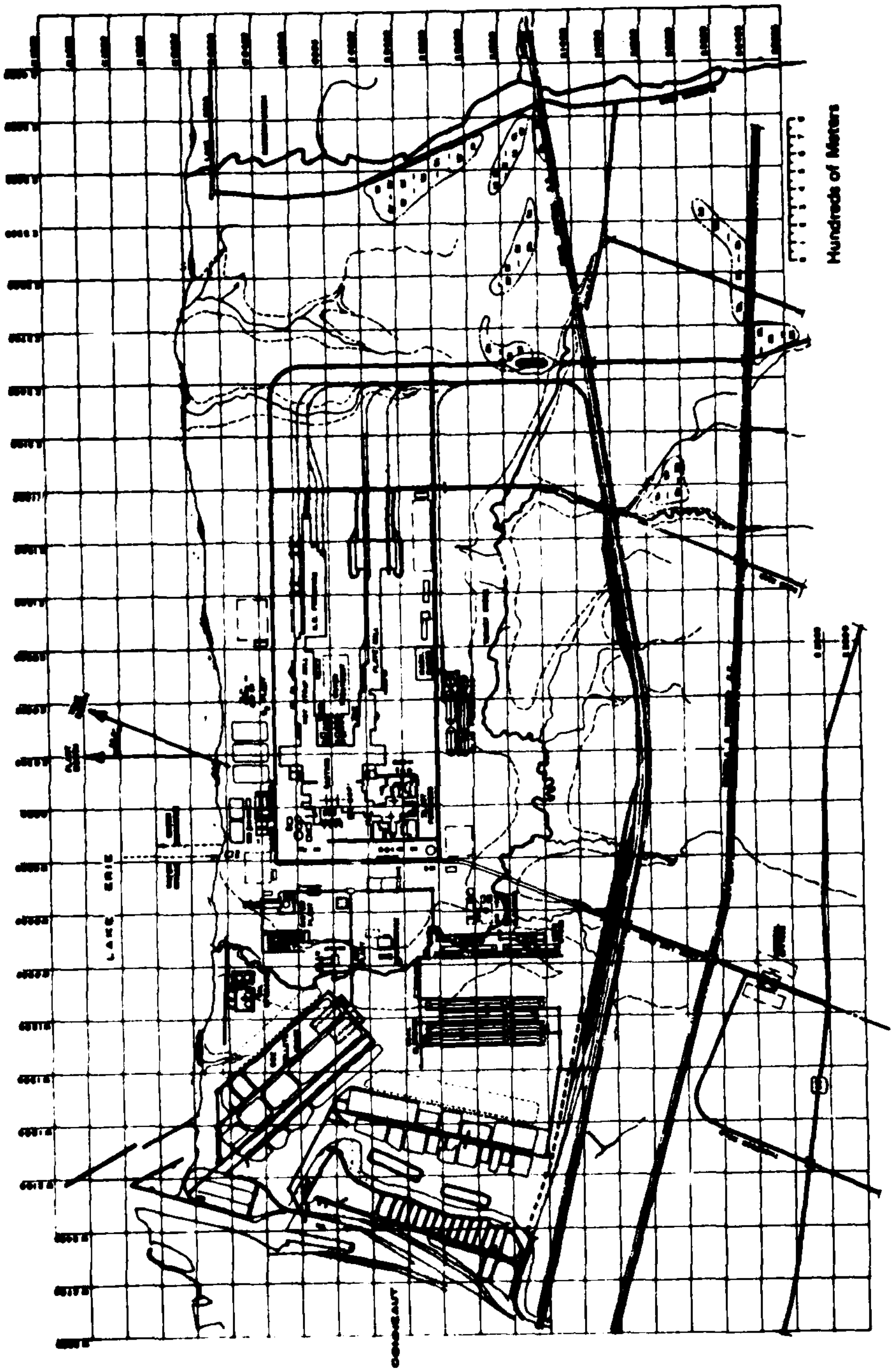


FIGURE 1-4 PROPOSED LOCATION OF LAKEFRONT PLANT PROCESS FACILITIES WITH RESPECT TO ON-SITE SURFACE WATER SYSTEM

1.38
The existing dock (Conneaut Harbor, East Pier) is to be extended contingent upon approval of permits as a part of plans for P&C's overall expansion to support the proposed plant. The Draft EIS described a proposal to construct a pier extension and a new dock both consisting of interconnected steel sheet pile cells. Comments received on the Draft EIS indicated that these proposals would destroy an unnecessary amount of bottom habitat and would impede the circulation of water in the harbor. In response to these concerns, a new design which occupies less habitat and allows free circulation of water is discussed in this Final EIS as the primary proposal. The remaining paragraphs of this section first describe the original proposal and then the new "open" design. The letters of comment pertaining to the original design and the new design are appended to this statement. The applicant's original proposal, as described in the Draft EIS, was to construct a pier extension of about 122 meters (400 ft.) in length and 9.1 meters (30 ft.) in width. This originally proposed extension would occupy an area of approximately 1,100 square meters (12,000 sq. ft.). Extension of the Conneaut Harbor, East Pier would be accomplished using a series of interconnecting steel sheet pile cells. In accordance with this proposal, a receiving hopper would be installed for use by self-unloading vessels. The pier extension would be adjacent to deepwater and would require no new dredging to facilitate docking.

1.39
The original proposal also included construction of a new adjoining dock in the harbor. The adjoining dock would connect to the extended East Pier at a 45 degree angle and have a total length of 335 meters (1,100 ft.), a width of 9.1 meters (30 ft.), and an area of about 3,100 square meters (33,000 sq. ft.). The new docking facility would also be constructed of interconnected steel sheet pile cells. A receiving hopper was also included on the new dock for use by self-unloading vessels. Construction of the new dock was planned during the period 1984 to the end of 1987 and total construction time is estimated at less than two years.

1.40
A total of 22,938 cubic meters (30,000 cubic yards) of fill would have been placed within the cells prior to capping with concrete. The fill for the steel cells will consist of suitable soils, slag, dredged material, and/or rock. Any imported fill material would probably be either sand obtained from local sand and gravel plants or slag from U.S. Steel's Lorain works. Concrete for the pier cap would be purchased from an existing batch plant in the vicinity of Conneaut (1-12) or the onsite batch plant. This original proposal included the incorporation of culverts into the sheet pile cells to provide limited water circulation through the piers, and to facilitate

flushing and mixing in the confined area between the piers. Figure 1-5 depicts the proposed pier extension and the new unloading dock as originally proposed.

1.41
Construction of these piers would require about four barges (two for handling and driving sheet pile, one for transport and storage of sheet pile, and one for storage of equipment such as welding machines, etc.), a tug or two, and about 20-50 men. Outfitting the pier with materials-handling machinery and building the associated on-land components would require some 300 personnel. The construction time for pier extension would be about two and a half years.

1.42
The applicant's current design for the pier extension and new dock is an open pier design as opposed to the original solid type pier design. This new design was reviewed and commented on by agencies which objected to the original proposal. Figures 1-6 and 1-7 display the design of the new proposal. The configuration of the open pier extension and open dock is the same as the original design. The pier extension is 122 meters (400 ft.) in length, and 12.2 meters (40 ft.) in width. The pier extension is supported on its lakeward end by a 15.2 meter (50 ft.) diameter cylindrical steel sheet pile cell. Between this terminal support and the existing Conneaut Harbor, East Pier, the proposed extension is supported by three 12.2 meter (40 ft.) diameter cylindrical steel sheet pile cells, and four steel pier supports which measure 12.2 meters (40 ft.) in length and 1.2 meters (4 ft.) in width. The supports for the pier extension will occupy about 600 square meters (6,460 sq. ft., 0.15 acres) of bottom habitat. This includes all of the supports for the extension including the terminal support, and also accounts for three target bin supports which measure about 0.9 meter (3 ft.) in diameter. Although the number of supports for the target bin has not been finalized, Corps staff has estimated about 12 supports for the purpose of calculating the loss of benthic habitat. The spaces between the alternating steel pier supports and cylindrical supports are about 8.2 meters (27 ft.). The cells will be filled with suitable soils, dredged materials, slag, and/or rock prior to capping with concrete. The open pier design requires an increased width over the original proposal to sustain its function of accommodating ship to shore unloading of ore ships.

1.43
The new dock, utilizing the current open pier design, will be 342 meters (1,122 ft.) in length and 12.2 meters (40 ft.) in width and will be attached to the 15.2 meter (50 ft.) diameter terminal support of the pier extension. Support for the new dock will be provided by eleven 12.2 meter (40 ft.) diameter cylindrical steel sheet pile

Figure 1-5 Originally Proposed Pier Extension Details (as shown in the Draft EIS)

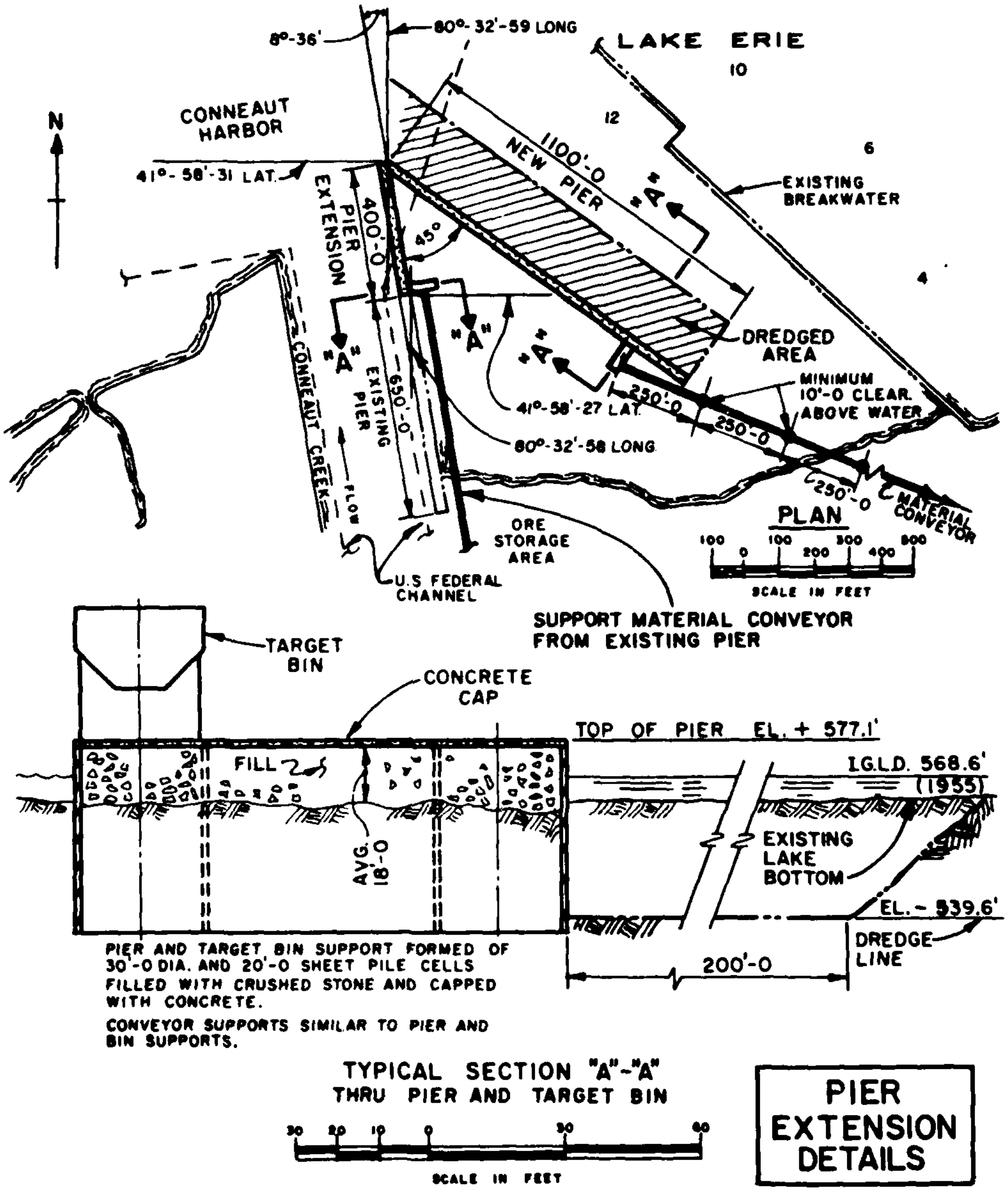


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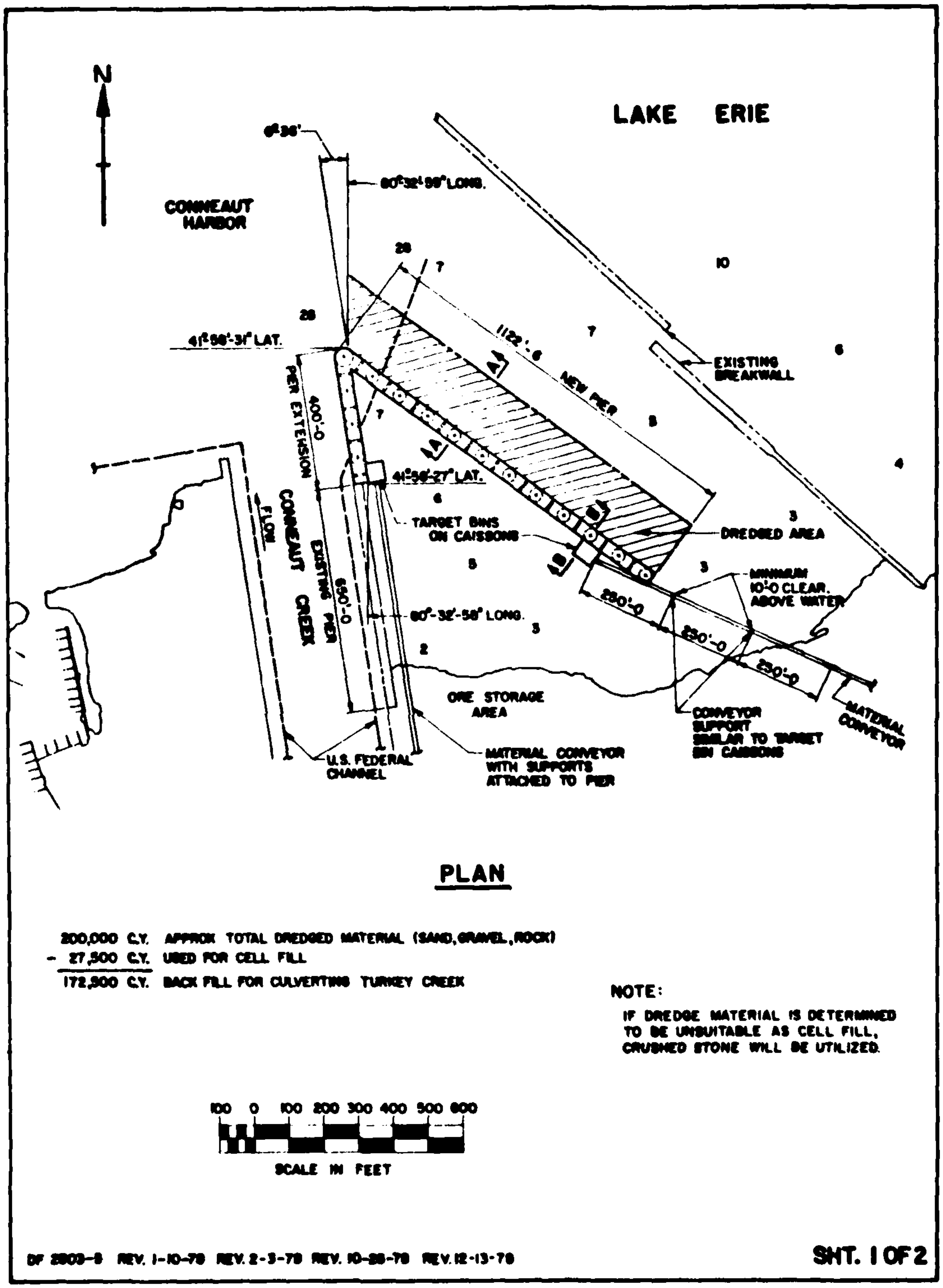
Figure 1-6 Pier Extension Details

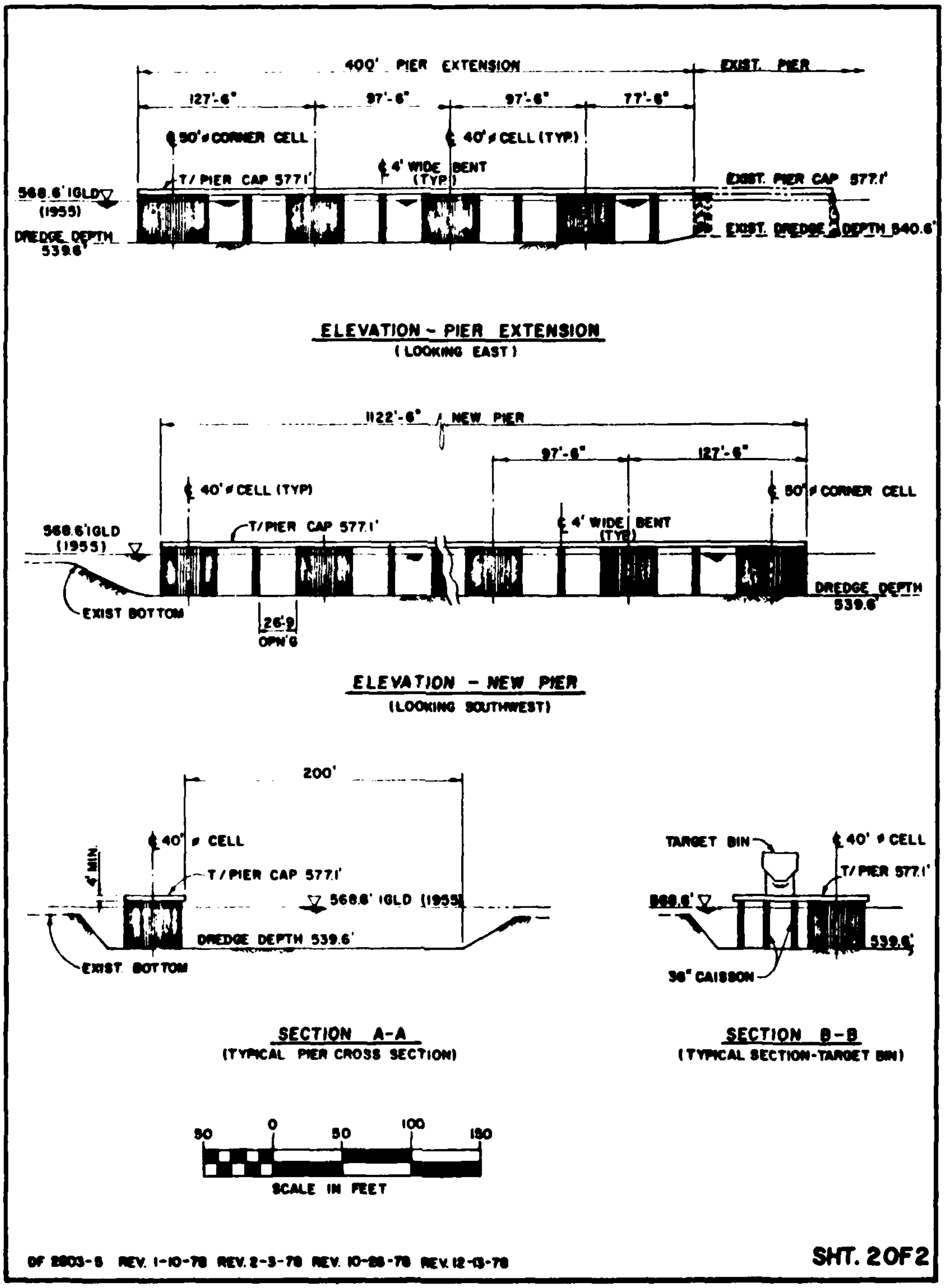


200,000 C.Y. APPROX TOTAL DREDGED MATERIAL (SAND, GRAVEL, ROCK)
\- 27,500 C.Y. USED FOR CELL FILL
172,500 C.Y. BACK FILL FOR CULVERTING TURKEY CREEK

NOTE:

IF DREDGE MATERIAL IS DETERMINED TO BE UNSUITABLE AS CELL FILL, CRUSHED STONE WILL BE UTILIZED.

Figure 1-7 Pier Extension Details (Continued)



ELEVATION - PIER EXTENSION
(LOOKING EAST)

ELEVATION - NEW PIER
(LOOKING SOUTHWEST)

SECTION A-A
(TYPICAL PIER CROSS SECTION)

SECTION B-B
(TYPICAL SECTION-TARGET BIN)

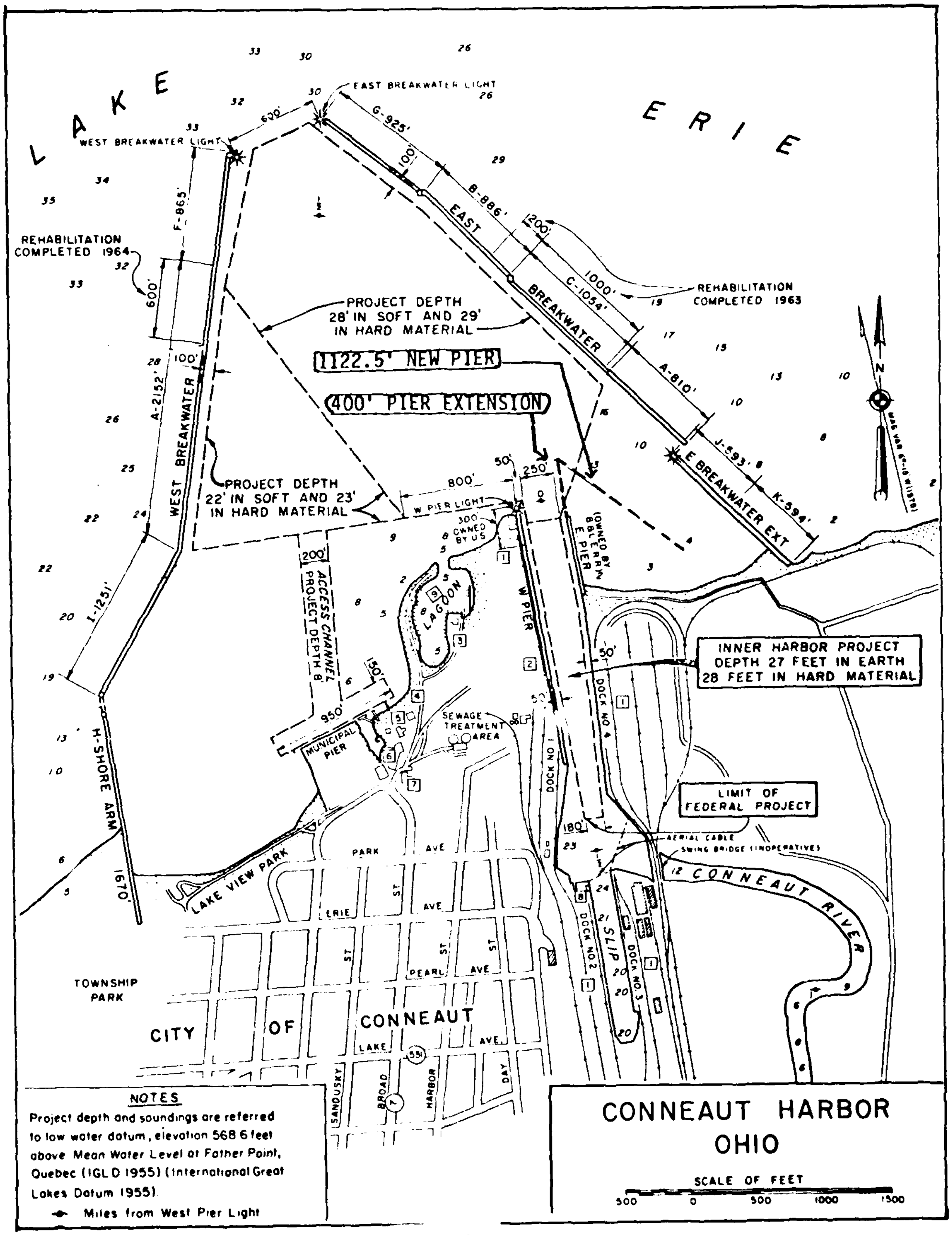
SCALE IN FEET

cells and eleven 0.9 meter (3 ft.) by 12.2 meter (40 ft.) steel pier supports. The supports (including target bin supports) will occupy approximately 1,456 square meters (15,572 sq. ft. or 0.36 acres) of bottom habitat. The spaces between the supports will be about 8.2 meters (27 ft.). Prior to capping with concrete the supports will be filled with materials similar to those used to fill the pier extension support cells. Approximately 21,026 cubic meters (27,500 cu. yds.) of material will be required to fill the pier extension and new dock support cells. The amount of equipment, manpower, and time needed to construct the open pier extension and new dock would be the same as that described in paragraph 1.42. The current concept of an open pier design will occupy a total of 0.51 acres of bottom habitat. This is about one-half the amount of bottom habitat occupied by the original closed pier design. Water circulation average hydraulic cross sectional area of the open pier design and dredged depth is at least two times greater than the existing undisturbed cross sectional area behind the pier. This provides excellent water circulation. The open pier concept can sustain the unloading conveyor, a 35-ton mobile crane, maintenance traffic, service utilities, nominal ship berthing, and normal physical stress and strain.

1.44
Immediately harborward of the new dock, an area measuring 1,100 feet by 200 feet will be dredged to a depth of 29 feet below low water datum elevation 568.6 feet (IGLD, 1955). Approximately 200,000 cubic yards of material would be dredged from the area. This dredging would occur under both the original and the current proposals. Portions of this material may be placed within the steel sheet pile cells, but the majority will be hauled to the proposed plant site where it will be used as backfill for the culverting of Turkey Creek. The area to be dredged is shown on Figures 1-5, 1-6, 1-7, and 1-7(b). Preliminary bottom sampling has indicated the presence of nearly uncovered bedrock on the harbor bottom. Thus, blasting may be required to remove this material.

1.45
Several agencies commenting on the open pier proposal suggested a possibility of realigning the new pier so that the dredging of shallow water areas could be avoided. A review of the Conneaut Harbor depth contours, the harbor shape, and harbor structures such as piers and breakwaters indicates that a realignment of the new pier would either affect ship movements and turning in the outer harbor, interfere with ships attempting to maneuver through the existing piers into the inner harbor, or affect even more shallow water area than the current proposal. Figure 1-7(b) shows the proposed pier extension and new pier in relation to existing harbor structures and harbor depths.

Figure 1-7(b) - PIER PROPOSAL IN RELATION TO HARBOR STRUCTURES AND BASINS



NOTES

Project depth and soundings are referred to low water datum, elevation 568.6 feet above Mean Water Level at Father Point, Quebec (IGLD 1955) (International Great Lakes Datum 1955)

◆ Miles from West Pier Light

1.46
Modification of the existing pier, construction of the new dock, and dredging require Department of the Army authorization under Section 10 of the Rivers and Harbors Act of 1899 and/or Section 404 of the Clean Water Act. It has not been determined whether P&C Dock or U.S. Steel would be responsible for day-to-day coordination and monitoring of the construction work. However, the port expansion is a necessary component of the overall project, and it is likely that both U.S. Steel engineers and P&C Dock engineers would participate directly in these aspects of the construction process. The first pier extension would be constructed during Step I of the construction plan (1979 to about mid-1982). The second pier would be constructed during Step II of the overall construction plan (1984 to the end of 1987).

1.47
The pier extension would be equipped with a material handling system to allow transfer of ore from the ship to open storage areas on land. This system would most likely consist of an extension of the existing conveyor system along the pier. The new section of dock (335 m) would contain a raw materials conveyor system which would connect to land by spanning approximately 600 to 700 feet of water. This conveyor system will be constructed on at least three equidistant stanchions placed in the water between the pier and the adjacent land. The elevated raw materials conveyor will extend from the shore terminus of the dock across Conneaut Harbor to the existing shoreline in the vicinity of the Pittsburgh and Conneaut Dock Company raw materials storage area. The structure will have a minimum clearance of 10 feet above low water datum elevation 568.6 feet (IGLD, 1955). Figure 1-6, and 1-7 display the current location of the raw materials conveyor system. A Department of the Army permit is also required for construction of the raw materials conveyor system.

1.48
After the projected expansions, the dock facilities will have a total capacity of handling about 14.4 million tonnes (15.8 million tons) of pellets per year, 4.1 million tonnes (4.5 million tons) of iron ore per year, and 2.1 million tonnes (2.3 million tons) of limestone per year. For the proposed plant, this facility will provide handling facilities for about 7.1 million tonnes (7.8 million tons) of pellets, 2.6 million tonnes (2.9 million tons) of iron ore, and 1.3 million tonnes (1.4 million tons) of limestone shipments. Table 1-5 gives the details of the capacity of the marine receiving facility, at present, and after the projected expansion in 1983. The shipments for the proposed plant are also indicated in Table 1-5. The Great Lakes route will be used by the carriers for about 10 months a year (March through December) while the St. Lawrence route will be shortened by two weeks at both ends of the shipping season. About 680 vessels will be unloaded annually in the period during which water

Table 1-5

Forecasts of Waterborne Raw Material Receiving and Shipments by The Pittsburgh and Conneaut Dock Company

	Pellets	Ore	Limestone
Shipment Sizes (Tonnes)(1)	14,000-60,000	14,000-28,000	14,000-32,000
Origin	Minn., Mich.	Minn., Quebec, Laborador	Mich.
Annual Shipments			
1977 - Dockings	279(3)		70
Quantities(2)	6.6(3)		1.4
1983 (Including Lakefont Plant)			
1983 - Dockings	400	180	100
Quantities(2)	14.4	4.1	2.1
Lakefront Supply			
- Dockings	170	100	70
Quantities(2)	7.1	2.6	1.3

---

(1) 1 tonne = 1.1 short tons.

(2) Quantities in millions of tonnes.

(3) Shipments of ore in 1977 are reported with pellets.

Source: United States Steel Corporation.

routes are expected to be open. Material will be stockpiled during the shipping season to be used during the winter months when the shipping routes are frozen and closed.

c) Rail Receiving Facilities

1.49
The principal raw materials delivered to the rail receiving facilities are steam coal for power and steam generation and metallurgical coal for the coke plants. The existing railway network to the P&C facilities will deliver the coal required for the proposed plant. The existing railway network is more than adequate to handle the 5.5 million tonnes (6.1 million tons) per year of steam and metallurgical grade coal required for the proposed plant.

1.50
Presently, coal is received in 55- to 90-tonne (60- to 100-ton) bottom dump hopper cars from the Bessemer and Lake Erie (B&LE) Railroad Company. The cars are pulled over an unloading pit by a remote-controlled locomotive. This operation is located on the west side of Conneaut Creek. A new coal unloading, storage, and reclaiming system is presently being constructed on the southern edge of the property to increase P&C's capacity for anticipated demands. This car unloading facility is being constructed to handle coal for customers other than U.S. Steel, but will include sufficient capacity to unload the steam and metallurgical grade coal required for the proposed plant.

1.51
In general, about 6.9 million tonnes (7.6 million tons) of steam coal and 0.8 million tonne (0.9 million ton) of metallurgical grade coal will have been received in 1977 by P&C. Most of the shipments will be received in unit trains (about 100-car) from coal mines in Pennsylvania and West Virginia. After the proposed expansion now underway, the rail receiving facilities are expected to handle about 5.7 million tonnes (6.3 million tons) of metallurgical grade coal and 11.7 million tonnes (12.9 million tons) of steam coal. Out of this, the shipments for the proposed plant will include about 4.8 million tonnes (5.3 million tons) of metallurgical grade coal and 0.7 million tonnes (0.8 million ton) of steam coal. A rail receiving and shipment forecast at Conneaut is presented in Table 1-6.

1.52
Standard gage railroads would be used to bring construction material to the plant site and also to ship finished products from the plant during the operational phase. In addition, special purpose rail systems would be used at several locations within the plant in connection with mobile cranes, piling and reclaiming machinery, the coke

Table 1-6

Forecasts of Rail Receiving and Shipments of Coal by The Pittsburgh and Conneaut Dock Company

	Metallurgical Coal	Steam Coal
Shipment Size (tonnes)(1)	8,000 - 9,000	8,000 - 9,000
Origin	Pa. - W. Va.	Pa. - W. Va.
Annual Shipments		
1977 - Frequency	120	900
Quantities(2)	0.9	6.9
1983 - Frequency	700	1,400
Quantities(2)	5.7	11.7
Lakefront Plant Only		
Frequency	550	90
Quantities(2)	4.8	0.7

---

(1) 1 tonne = 1.1 short tons.

(2) Quantities in million tonnes.

Source: United States Steel Corporation.

oven operation, etc. Design and construction of the railroad bed would be done in a manner to assure continued bed stability after numerous cyclical loading evolutions. After the bed location had been laid out, excavation would take place to prepare for the placement of the sub-ballast consisting of large aggregate. The sub-ballast would be compacted and a second layer of sub-ballast would be applied. Ties would be placed and tracks would be laid and aligned, first in approximately final position, then in a carefully surveyed position. The rails would then be spiked to the cross ties and final ballasting, packing, and gaging would take place. An eight-track car storage area would be constructed on the southern portion of the site. In all, it is estimated that some 25 miles of permanent railroads would be built within the plant site. (1-2, 1-3)

d) Transfer of Pellets, Iron Ore, and Limestone from Unloading to Storage

1.53
Iron ore and limestone shipped on bulk lake carriers will be offloaded by five electric Hulett unloaders, each having a maximum rate of 1,800 tonnes (2,000 tons) per hour. The total maximum unloading rate will be about 9,000 tonnes (9,900 tons) per hour. The self-unloading lake vessels will unload material directly into receiving hoppers. Material from the receiving hoppers will be fed to a 10,000-tonne (11,000-ton) per hour transfer conveyor system which will interconnect the receiving hoppers with the storage. Iron ore and coal would be temporarily deposited in blending piles where various grades would be mixed to achieve desired qualities for processing. The material received from the transfer conveyor system will be stockpiled by rail stacker/reclaimer system as described in Table 1-7. The stacking and reclaiming machinery would be mobile and travel on rails parallel to conveyors which supply and remove, respectively, the materials from the blending areas. The pellets will be handled by a 10,000-tonne (11,000-ton) per hour stacker with a reclaiming capacity of 4,000-tonnes (4,400-tons) per hour, while the ore and limestone from the conveyor system will have their own stacker/reclaimer of similar capacity.

e) Storage and Distribution of Pellets, Iron Ore, and Limestone

1.54
The rail-mounted combination stacker/reclaimers will receive pellets, iron ore, and limestone from the dock-side hoppers by the conveyor belts interconnecting the two systems and build segregated piles of ore, pellets, and stone. All components of the conveying system carrying material to the stackers will be interlocked and operated from a central control center for the ore yards. A monitor will also be utilized to control the operation of the system, whenever

Table 1-7

Type and Style of Stacker/Reclaimers Planned for the Proposed Facility

Raw Material	Type	Style
Pellet	Combination stacker/ bucket wheel reclaimer and tunnel reclaim.	Rail mounted, luffing and slewing stacker/reclaimer; 10,000 tonnes (11,000 tons) per hour stacking capacity, 4000 tonnes (4400 tons) per hour reclaiming capacity.
Ore	Combination stacker/ bucket wheel reclaimer and tunnel reclaim.	Rail mounted, luffing and slewing stacker/reclaimer; 10,000 tonnes (11,000 tons) per hour stacking capacity, 3000 tonnes (3300 tons) per hour reclaiming capacity.
Limestone	Combination stacker/ bucket wheel reclaimer.	Rail mounted, luffing and slewing stacker/reclaimer; 10,000 tonnes (11,000 tons) per hour stacking capacity, 3000 tonnes (3300 tons) per hour reclaiming capacity.

Source: United States Steel Corporation.

appropriate. The storage piles will be sized to provide 90 days of storage for pellets and limestone/dolomite and 120 days of iron ore, as follows:

	Annual Requirements in Tonnes (Tons)	Storage Capacity in Tonnes (Tons)	Storage Area in Square Meters (Sq Ft)
Pellets	7,100,000(7,810,000)	1,775,000(1,952,500)	59,000 (635,000)
Iron Ore	2,600,000(2,860,000)	867,000(953,700)	73,000 (786,000)
Limestone/ Dolomite	1,300,000(1,430,000)	325,000357,500)	70,000 (753,000)

1.55
The storage pile areas would be prepared to receive the blending piles by grading, surface preparation, construction of foundations, and installation of the stacking and reclaiming machinery. No details are available concerning the design of the drainage system for the storage areas. Conceptually, these areas will be drained to retention/treatment ponds as required.

1.56
Reclaim tunnels will be installed under the eastern ends of the ore and pellet storage piles. Remote-controlled feeders will draw ore and pellets from the piles onto rubber belt conveyors installed in the tunnels. During the lake shipping season (approximately nine to ten months), ore and pellets will be stocked over the tunnels to minimize reclaimer bucket wheel operation for these two materials. In winter, when lake shipping is at a minimum, the bucket wheel reclaimers will reclaim ore and pellets from the western end of the storage piles and transfer them to the conveying system. Limestone will be reclaimed from storage all year by the bucket wheel machines.

1.57
Pellets will be transferred from storage at a maximum rate of 4,000 tonnes (4,400 tons) per hour on a conveyor system feeding the blast furnace stockhouse. Approximately 7,500 tonnes (8,200 tons) per day of ore will be transferred to the sinter plant blending bed feedbins. Limestone will be routed to the sinter plant bins and the burnt lime plant. The average daily use of limestone will be as follows: sinter plant 330 tonnes (360 tons) per day, and burnt lime plant 3,300 tonnes (3,600 tons) per day. Two conveyor belts will be incorporated in the reclaiming and transfer system, each capable of handling the raw materials to the different destinations. All reclaimers, feeders, gates, and conveyors will be interlocked and operated from the central control room for the ore yards. Bin level indication

will also be transmitted to the control room for the selection of material deposition.

1.58
Fugitive emissions will be created whenever material is transferred from one conveying belt to another. Therefore, transfer points in remote locations in the stockpiling area will be hooded, and the conveyor belt, will be covered or housed in galleries to contain the emissions so that they settle onto the receiving conveyor. Transfer points inside the buildings will include hoods and a dust collection system to capture the dust-laden air which will be cleaned in a baghouse. Off-gases from the baghouse will exhaust to the atmosphere.

1.59
The primary potential pollutants to surface drainage waters are suspended particulates from the iron ore, pellet, and stone stockpile. Drainage from these piles will be intermittent and dependent upon rainfall and the temperature at the site. The stockpile bases will be sloped at grades of 0.35 percent so that the runoff water can be collected in ditches leading to separate collection ponds for each raw material. Settled solids in ponds will periodically reclaimed by front-end loaders and returned to the stockpiles for eventual use as plant feed material. Clear water from the top of the ponds will be pumped to the plant outfall system.

f) Storage and Distribution of Coal

1.60
Coal for the proposed plant will be received from the P&C dumping system at a transfer tower near the dumper, at a rate of 2,700 tonnes (3,000 tons) per hour and conveyed to the open blending and storage area. Open storage will provide a supply of blended coal for about 45 days (approximately 600,000 tonnes (660,000 tons)). The storage area will have two stacker/reclaimers. The twin fixed boom rail mounted units will have a stacking capacity of 3,000 tonnes (3,300 tons) per hour. The rail-mounted bridge type reclaimer with traversing bucket wheel mounted on the bridge will have a reclaiming capacity of 1,000 tonnes (1,100 tons) per hour.

1.61
The coal storage area will be located at the west side of the proposed coke plant. Four new bed blended stockpiles will be constructed to supply this storage. Low-volatile and high-volatile coals will be stocked in separate sections of each pile. The total coal blending storage will cover an area of about 180,000 square meters (1,614,000 square feet). The tracking stacker between each pair of coal piles will build a blended coal pile by moving continuously along the pile length while discharging coal from the boom

belt. An average expected composition (wet basis) of the high-volatile and low-volatile coal deposited in this storage area is shown below:

	High Volatile Coal (Percent)	Low Volatile Coal (Percent)
Volatile Matter	31.8	17.1
Ash	4.7	5.5
Sulphur	0.7	0.6
Fixed Carbon	56.8	70.8
H_2O	6.0	6.0

1.62
As one pair of piles is being built, coal requirements of the coke plant will be supplied from the other pair of piles. The reclaimer bucket wheels will be programmed to automatically traverse the pile width, and the reclaimer will advance a pre-set distance after each traverse. Transfer cars for each reclaimer will be provided to move the reclaimer to a full pile when it has completed excavation of the pile in current use.

1.63
The blended coals will be withdrawn from the beds for crushing, grinding, and proportioning to the charge mix for delivery to the coke ovens. The reclaimer and conveying system to the coal preparation plant will be sized for 1,000 tonnes (1,100 tons) per hour. All operations of stockpiling, reclaiming, and conveying will be operated from a central control office for the coal supply.

1.64
As in the case of the ore, pellets, and limestone storage areas, all conveyor belts will be covered or housed in galleries so that emissions will be contained and settle onto the receiving conveyor. Where transfers occur inside buildings, a baghouse will be installed on the dust collection system. The coal stockpile will have a drainage water control system similar to the procedure used for the ore, pellets, limestone, and stockpile system.

1.65
If the reclaiming machine is out of service for an extended period, an underground 20-tonne (22-ton) reclaiming hopper will permit coal to be moved into the system at a reduced rate with mobile equipment. During normal operation, the coal recovered from the piles by the

reclaimer will travel on a conveyor system at the rate of 1,000 tonnes (1,100 tons) per hour, 16 hours per day, to the coal screening station. Magnets will remove tramp pieces of iron and steel from the coal before it enters the primary screening section. Coal smaller than 13 millimeters (0.51 in.) will pass through the primary screens and be conveyed to any of six 1,400-tonne (1,540-ton) raw coal blending bins.

1.66
Each hour approximately 400 tonnes (440 tons) of coal greater than 13 millimeters (0.51 in.) in size will pass through a breaker to achieve a uniform size distribution. Coal leaving the breaker station will be discharged into a conveyor system for transport to the raw coal blending bins for crushing. High and low volatile coals will be stored separately. Operating at full capacity the six raw coal collecting bins will be able to supply the coal crushing facility for about nine hours.

Coke Plant

1.67
Strong, reactive metallurgical grade coke for the proposed plant blast furnaces will be produced by four coke oven batteries at the site. Each battery will consist of 42 8-meter-high slot ovens. The raw material for the coke plant -- 4.8 million tonnes (5.3 million tons) of metallurgical grade coal -- will be delivered to the plant by unit trains from Pennsylvania and West Virginia. A 45-day supply of coal will be blended and stored in piles adjacent to the coke batteries.

1.68
Metallurgical grade coal will be screened, cleaned of tramp metal, crushed to three millimeters (1/8 in.) and stored in coal blending bins. Crushed high and low volatile coals will be blended in a rotary mixer prior to preheating. Normally, four preheating units fired with desulfurized coke oven gas (COG) will flash dry and preheat the coal feed to 200°C (392°F) and one percent moisture. Cyclones and wet electrostatic precipitators will recover the hot pulverized coal from the preheater exhausts; the hot coal will be transported by enclosed chain conveyors to hot coal charging bins between each pair of coke oven batteries.

1.69
Electrically driven larry cars atop each battery will receive hot coal from the charging bins and charge it to empty slot ovens by a staged charging sequence. Telescoping sleeves will enclose transfers to and from the larry cars. Leveling of the coal in the ovens will not be necessary due to the self-leveling characteristics of hot coal

charging. As shown schematically in Figure 1-8, each oven is filled, sealed, and raised to temperature and then pushed to discharge the coke. COG driven off from the coal in the coke ovens will be collected by two COG mains atop each battery. A byproduct plant will remove tars and light oil from the COG, produce saleable sulfuric or sulfur from the H_2S and anhydrous ammonia from the NH_3 in the COG, and reduce the residual H_2 content of the gas to 0.84 gram per normal cubic meter (0.35 gr/scf). Part of the cleaned COG will be diluted with blast furnace gas (BFG) and used to underfire the coke ovens. The remainder will be used throughout the proposed plant.

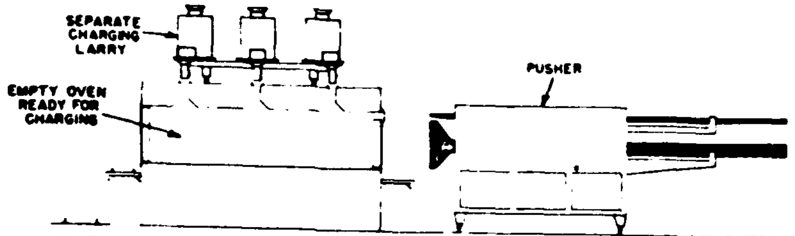
1.70
After 13-14 hours, the tall narrow doors at each end of a slot oven will be removed. At one door, the pushing machine will insert a ram to force the incandescent coke out of the oven through the opposite door. A moving telescoping guide will enclose the coke as it emerges from the oven and falls into the single spot coke car. The gaseous emissions will be exhausted from the hot coke car as the coke is pushed through a covering hood to a fixed duct system. The hot coke car will proceed to the recirculated quench tower where water will pour through the coke. The cooled coke will be dumped from the coke car onto the coke wharf for final cooling before being sent to the coke screening station at the blast furnaces. Blast furnace size coke will be charged to the furnaces and coke breeze (fines) will be used in the sinter plant. Material flow through the coke plant are summarized in Table 1-8.

a) Raw Material Preparation

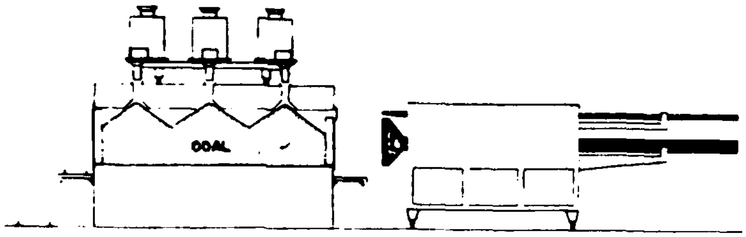
1.71
The raw material for the coke plant will be washed and cleaned metallurgical grade coal. It will be delivered six days per week in hopper cars at the new coal unloading and storage area being built on the southern edge of the property. In freezing weather, the cars may be held for several hours in large thaw sheds where COG-fired burners will thaw the coal. When the coal can be removed, each car will be positioned and tipped over in a rotary car dumper, thus discharging the coal into a large hopper. A conveyor system will transfer the coal from the unloading hopper to a transfer tower near the dumping system at a rate of 2,700 tonnes (3,000 tons) per hour.

1.72
Pulverization and blending of the high and low volatile coals is necessary to achieve high quality coke and to avoid a coal mix that causes excessive pressure on the oven walls by expansion during the coking process. For this reason, three (two operating and one spare) crushers with a combined operating capacity of 650 tonnes (715 tons)

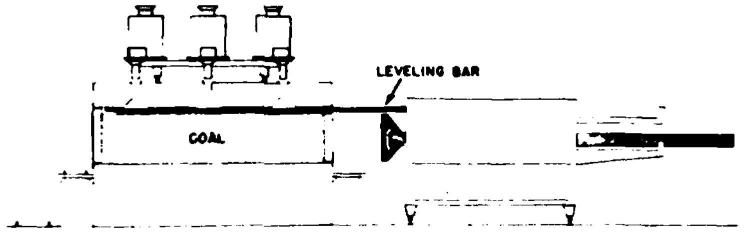
CHARGING, LEVELING AND PUSHING OPERATIONS IN ONE COKING CYCLE OF A BY-PRODUCT COKE OVEN



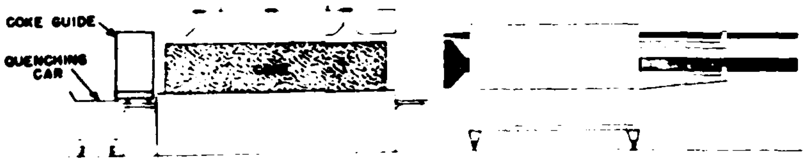
A. THE CHARGING LARRY, WITH HOPPERS CONTAINING MEASURED AMOUNTS OF COAL, IS IN POSITION OVER CHARGING HOLES FROM WHICH COVERS HAVE BEEN REMOVED. THE PUSHER HAS BEEN MOVED INTO POSITION.



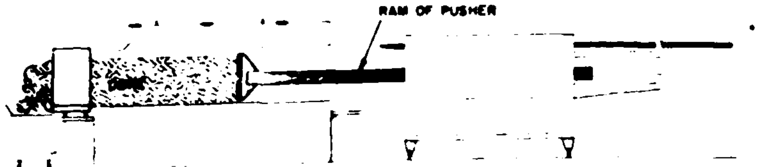
B. THE COAL FROM THE LARRY HOPPERS HAS DROPPED INTO THE OVEN CHAMBER, FORMING PEAKED PILES.



C. THE LEVELING DOOR AT THE TOP OF THE OVEN DOOR ON THE PUSHER SIDE HAS BEEN OPENED, AND THE LEVELING BAR ON THE PUSHER HAS BEEN MOVED BACK AND FORTH ACROSS THE PEAKED COAL PILES TO LEVEL THEM. THE BAR NEXT IS WITHDRAWN FROM THE OVEN, THE LEVELING DOOR AND CHARGING HOLES ARE CLOSED, AND THE COKING OPERATION BEGINS.



D. COKING OF THE COAL ORIGINALLY CHARGED INTO THE OVEN HAS BEEN COMPLETED (IN ABOUT 18 HOURS) AND THE OVEN IS READY TO BE "PUSHED." THE OVEN DOORS ARE REMOVED FROM EACH END, AND THE PUSHER, COKE GUIDE AND QUENCHING CAR ARE MOVED INTO POSITION.



E. THE RAM OF THE PUSHER ADVANCES TO PUSH THE INCANDESCENT COKE OUT OF THE OVEN, THROUGH THE COKE GUIDE AND INTO THE QUENCHING CAR.

Figure 1-8 Coke Oven Schematic

Table 1-8

Coke Plant Annual Inputs and Outputs

		Tonnes	(Tons)
Inputs:	Metallurgical Grade Coal		
	High Volatile	3,360,000	(3,700,000)
	Low Volatile	1,440,000	(1,580,000)
Outputs:	Furnace Coke	3,250,000	(3,580,000)
	Clean Coke Oven Gas	1,606,000,000 Nm^3	59,775 MM scf(2)
	COG to Preheaters	162,410,000 Nm^3	6,045 MM scf
	COG to Underfiring(1)	613,200,000 Nm^3	22,820 MM scf
	COG to Plant Operations(1)	Remainder	Remainder
	Anhydrous Ammonia	11,100	(12,200)
	Sulfuric Acid	23,500	(25,800)
	Light Oils	40,200	(44,220)
	Tar	175,560	(193,120)

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(1) This quantity of COG will be maximum used for underfiring including preheating, when blast furnace gas is not available.

(2) Nm^3 = Normal cubic meter; scf = standard cubic foot

Source: United States Steel Corporation.

per hour for high volatile coal, and three coal crushers (two operating and one spare) with combined operating capacity of 280 tonnes (310 tons) per hour for low volatile coal will operate 16 hours per day, crushing the coal to a size smaller than 3mm (1/8 in.). High and low volatile coals will be crushed separately because of the difference in grindability index. Separate grinding plus the use of rotating cage mills to actually do the crushing minimizes the generation of fines. Individual coals will be automatically metered from the bottom of the raw coal blending bins and carried to the coal crusher building by conveyor; tramp metal will be removed magnetically from the conveyors before they reach the crushers.

1.73
The various grades of pulverized coal will be conveyed to a 930-tonne (1,020-ton) per hour paddle-wheel mixer where they will be thoroughly blended. A bypass chute will be installed ahead of the coal mixer for use when the mixer is being repaired. Coal leaving the mixer building by belt conveyor will pass through an enclosed sample and transfer station prior to loading the 4,500-tonne (5,000-ton) blended coal bunker. The sample and transfer station will obtain representative portions of the blended coal for regular analysis of bulk density, moisture, size distribution, volatile matter, sulfur content, and ash content. The blended coal entering the blended coal bunker will have the nominal composition shown in Table 1-9. (Normally, blended coal from the 4,500-tonne (5,000-ton) bunker will proceed to the coal preheaters. In emergency conditions, wet coal can be charged directly to the coke ovens. To assure smooth operation of the coke ovens during wet coal charging, the moisture content and bulk density of the pulverized coal will be controlled at the coal blending station. Water will be added to the coal mixer, if necessary, to maintain constant moisture content. No. 2 fuel oil may be added at the coal mixer to maintain constant density. Uneven control of moisture and bulk density during wet coal charging of the ovens will result in variations in the oven loading characteristics and the heat requirements for coking.)

b) Coal Preheating

1.74
If the blended, pulverized coal expected to be received at the proposed plant were charged directly to the coke ovens, the American Society for Testing of Materials (AS) stability of the resulting coke would probably be only 52 to 54. This is inadequate, since the large blast furnaces being contemplated require an ASTM stability index of 58 to 60. However, a strong coke meeting stability index requirement can be made if the coal is more finely pulverized and preheated to about 200°C (392°F) before charging the ovens. Thus, in normal operation, 560 tonnes (620 tons) per hour of coal (80 percent less

Table 1-9

Nominal Composition of Blended Coal

Constituents	%
High Volatile	70%
Low Volatile	30
Moisture Content	6
Proximate Analysis, Dry Basis	
Volatile Matter	29.4
Fixed Carbon	65.0
Ash	5.6
Sulfur Content	0.68

Source: United States Steel Corporation.

than 3mm (1/8-inch) in size) will be withdrawn from the blended coal bunker on enclosed rubber belt conveyors and crushed in tertiary rotary cage pulverizers (two operating, one on standby) so that 95 percent of the total volume is less than 3 mm in size. These pulverizers will be enclosed and the gas exhausted through a baghouse to remove airborne dusts. The finely pulverized coal will then be transported by conveyor belt to two 100-tonne (110 ton) preheating coal bins. Each bin feeds a separate preheating line and each line consists of three preheating units (two operating and one spare) with individual capacities of 142 tonnes (156 tons) per hour. The preheating units will burn in air a total of approximately 18,540 Nm^3 *(694,000 scf/hr) of desulfurized COG at 4400 kcal/Nm^3 (510 Btu/scf); the heated high velocity gas stream will entrain, heat, and dry the coal, as it is fed into the preheaters through rotary valve airlocks. The coal, now at 200°C (392°F) and one percent moisture, will be collected from the warm gas stream by cyclones and wet electrostatic precipitators (through which the gas will be exhausted) and transported to four 500-tonne (550-ton) hot coal charging bins (one at the end of each 42-oven battery block) by enclosed chain conveyors blanketed with inert gas. The inert gas exhausted from the hot coal bins will be cleaned by wet electrostatic precipitators.

c) Coke Battery Operation

Coal Charging

1.75

In normal operation, preheated coal will be loaded into a coal charging larry car atop each battery which will then charge the coal into an empty slot oven. The bottom outlets of the charging bins will be equipped with power-driven telescopes which will drive a full diameter cover down on the top ring of each larry car hopper to form a seal. (There will be four hoppers in each larry car, corresponding to the four charging ports atop each slot oven.) A predetermined volume of approximately 56 cubic meters (2,000 cu. ft.) of hot coal will be discharged from the hot coal charging bin into the larry car. The volume transferred will be controlled by adjustable volumetric cones in the larry car hoppers and checked on the basis of the weight transfer measured by charge bin load cells of approximately 46 tonnes (51 tons) per charge.

1.76

As the larry car hoppers are filled with preheated coal, the displaced gas will be withdrawn from the top cover plate and

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*Nm^3 = Normal cubic meter
scf - Standard cubic foot

discharged through the hot coal bin wet electrostatic precipitator prior to release to the atmosphere. The recovered coal fines will be recycled to the sinter plant. Once fully loaded, a larry car will be disconnected from the charging bins and using electric drive motors, propel itself along a wide gauge railroad track on top of the coke oven battery. The larry car will position itself precisely over an empty slot oven. The lids on the oven's coal charging ports will be removed be electromagnets on the larry car, and telescoping coal discharge chutes at the bottom of each of the four larry car hoppers will be lowered and sealed in the charging hole castings. The oven is then completely sealed from the atmosphere by closing the standpipe cap; the dampers in the collecting mains will be opened, and aspirating steam started in the two goosenecks on each end of the slot oven.

1.77
The oven will be charged by opening the shear gates and starting the screw feeders at the bottom of the two outside hoppers. When the low-level indicators show that they are finished charging, the screws will be stopped and the shear gates closed automatically. The drop sleeves on the two outer hoppers will be raised and the lids will be replaced by the magnets. The two center hoppers will be discharged in the same manner. The flow of coal into the oven during charging will be controlled at a rate which will prevent excessive gas pressure from developing in the oven. After all charging lids have been replaced, the larry car will proceed to the next oven to be charged and will mechanically clean the goosenecks and standpipes prior to returning to the charging bin for the next load of hot coal. Meanwhile, personnel working on top of the battery will check the charging hole lids of the freshly charged oven to be sure they are properly sealed. At the conclusion of the inspection process a clay slurry will be poured around these lids to complete the seal. The standpipe caps will be sealed with clay slurry by the larry car operator during return to charge the next scheduled oven.

1.78
This sequential charging of the variable speed screw feeders under the larry car hoppers, adequate supply of high pressure steam to the aspirators, and control of the coal volume charged is designed to minimize charging emissions. Regardless of whether preheated or wet coal is being charged, it will take 4 to 4-1/2 minutes for the coal to flow into an oven. With preheated coal, there will be a maximum of 288 charges per day. With wet coal, the coking cycle will take longer and there could only be a maximum of 224 charges per day. In the emergencies requiring the use of wet coal, the same technique described above (similar to the proposed technique at the U.S. Steel Fairfield #1 Battery) will be used to charge the wet coal to the ovens.

Coking

1.79
Coking, the process of high temperature carbonization that converts coal to hard, reactive, low volatile coke, will occur in four coke batteries, each with 42 slot ovens. Individual ovens will measure 800 centimeters high, 1,620 centimeters long, and 45 centimeters wide (26 ft. x 53 ft. x 1.5 ft.). The batteries will be erected in two end to end pairs so that the general configuration of the coke oven batteries is an extended in-line facility.

1.80
The conversion of coal containing six percent moisture to coke requires approximately 10,900 kcal/kg (1,250 Btu/lb). Since most of the moisture has been removed and the temperature raised, preheated coal requires about 25 percent less fuel be burned in underfiring the coke ovens; it also needs to stay in the oven a shorter time, only 13-14 hours, as compared to the conventional 17-18 hours for wet coal. By the end of the coking cycle, the coke reaches a temperature close to 1,100°C (2,000°F). The fuel for the coking process is provided by burning with preheated combustion air either about 40 percent of the COG, or mixtures containing BFG with as little as five percent to 15 percent COG, to enrich the lean BFG. The hot gaseous products of this combustion rise up through about 50 percent of the flues lining the oven walls and down the remaining flues, through brick checkerwork regenerators beneath the ovens, through a waste heat canal joining all of the ovens, and finally up a brick-lined concrete stack approximately 110 meters (360 ft.) high. The battery exhaust flues will be constructed with space provided for future installation, when required, so that a stack control system could be installed by U.S. Steel. The combustion process is similar for any fuel mix, except that when enriched BFG is used both air and BFG are preheated separately in the regenerators. COG is not preheated before combustion.

1.81
During the coking cycle approximately 29 percent (dry basis) of the coal volatizes as raw COG and leaves the oven by way of vertical standpipes located at the top of each end of the oven and enters the collecting mains. A steam aspirator assists in the flow of gas from the oven, through the gooseneck and damper valves, into the two collecting mains. The collecting mains run the length of the batteries and carry the gases to the byproduct plant, where the raw COG is processed and cleaned as described in the following section of this chapter.

d) Pushing

1.82
At the end of the coking cycle, doors at both ends of the oven are opened, and the incandescent coke is pushed out of the coke side (side of the battery where the hot coke transfer car is located) of the oven by a steel ram which is extended through the oven by the pusher machine. A telescoping coke guide surrounds the coke as it emerges from the oven and falls into the single spot quench car. A movable hood completely covers the quench car to capture gaseous and particulate emissions from pushing the hot coke. The emissions from the quench car and from the coke guide during pushing will be continuously withdrawn through the covering movable hood to a fixed duct system and cleaned in a scrubber situated at the end of the battery. Scrubbing water will be discharged to the water treatment system for cleaning. When the oven is empty, the oven doors and door jambs will be automatically cleaned; they may be kept open for some time and the standpipe cap may also be opened to allow air to flow through the oven and burn off obstructive carbonizing deposits along the oven roof. The doors will be closed before the oven is charged again.

e) Quenching

1.83
The closed quench car carries the hot coke into the quench tower located at the end of the battery. A deluge of water falls through the hot coke in the car, quenching the temperature from 1,100°C (2,000°F) to 170° (338°F). Baffles in the top of the quench tower will reduce the particulate loading of the escaping steam. Fresh water makeup will maintain the quench sump level; there will be no water discharge from the tower since the quench water is evaporated in the quenching operation.

1.84
The quench car will then proceed to the coke wharf, where the coke will be discharged through side gates on the quench car. While on the inclined wharf, excess water will drain from the coke and the coke will cool to a reasonable handling temperature. A mechanical plow will be used to discharge coke from the lower edge of the wharf at a controlled rate onto a conveyor belt which carries the coke to the blast furnaces. Crushing and screening of the coke will be done at the blast furnaces. Furnace-size coke will be charged in the burden and undersize coke screening (coke breeze) will be sent to the sinter plant.

Coal Chemical Plant

1.85
Raw COG leaves the ovens by two ascension pipes, located at each end of the oven slots. This gas is rich in fuel content, valuable tars and oils, and contains noxious gases such as NH_3, H_2S, and HCN. These byproducts will be recovered from the COG in the byproduct plant as shown schematically in Figure 1-9 and designed on the basis of the yield and flow rates shown in Table 1-10.

1.86
As the COG leaves the ovens, it is cooled by flushing liquor sprays (mostly water) in the ascension pipe and coke oven gas mains. These sprays cool the COG to 80°C (176°F) condense tar and water, and absorb ammonia. From the COG main, the flushing liquor enters heavy tar boxes where rotating sieve drums and scrapers remove heavy tar. Approximately 4,400 liters (1,150 gal/per day) of tar sludge will be ground in a rod or bar mill before storage. From the tar boxes, the flushing liquor will enter vertical decanters which will remove the remaining tar. The tar underflow from the decanters will be dried two percent moisture) in steamheated dehydrators operating at 100°C (212°F) and stored in insulated tanks to prevent solidification. Most of the flushing liquor overflowing from the decanters will be recycled to the coke ovens. The excess flushing liquor -- 687,000 liters (180,000 gal) per day -- will go to a 3,800 cubic meter (one million gal) contaminated water storage tank.

1.87
The raw COG exiting the COG main at 80°C (176°F) will be cooled further to 40°C (104°F) in three primary coolers (two operating and one spare), by direct contact with recirculating liquor sprays. Tar contained in the liquor leaving the primary coolers will be removed in the primary cooler decanters and sent to other insulated tar storage tanks. The recirculating liquor will be cooled in wet surface heat exchangers and the excess liquor (water given off by the coal) will go to the water treatment system.

1.88
Two steam-driven centrifugal exhausters will compress the cool COG leaving the primary cooler to 0.18 kilograms per square centimeter (2.5 psig) before it passes through one of two electrostatic precipitators (one operating, one spare). At least 98 percent of the tar mist in the COG will be removed by the precipitators and sent to the primary cooler decanter. Initially, all the tar from the tar boxes, the flushing liquor and primary cooler decanters, and the electrostatic precipitators will be used as supplementary fuel to the blast furnace. Alternatively, the tar might be sold on the open market for further processing.

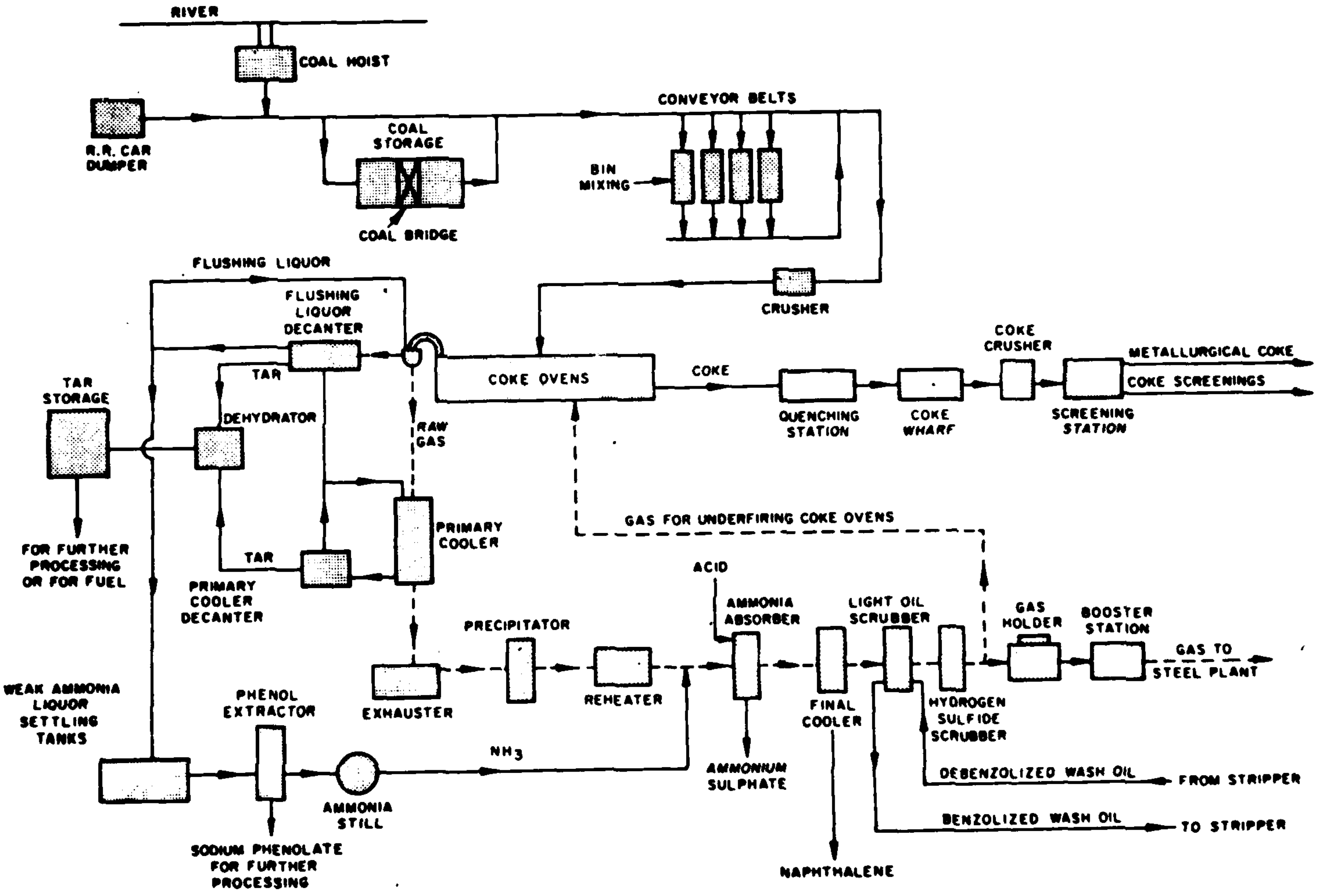

Figure 1-9 COAL CHEMICAL PLANT SCHEMATIC

Table 1-10

Byproduct Plant Design

Basis: Raw COG Input = 4.4×10^6 Nm^3/day (164. MMSCFD)

	Quantity			
	Daily		Annual	
Byproduct	Tonnes	(Tons)	Tonnes	(Tons)
Coke Oven Tar	480	(528)	175,560	(193,120)
Light Oil	110	(121)	40,200	(44,220)
Anhydrous Liquid Ammonia	35.2	(38.7)	12,800	(14,080)
Sulfur, or	19.6	(21.6)	7,140	(7,850)
Sulfuric Acid, 93% SO_4 Equivalent	64.4	(70.8)	23,500	(25,850)

Source: United States Steel Corporation.

1.89
After passing through the electrostatic precipitators, the COG enters the naphthalene scrubber-secondary cooler. Recirculating wash oil (a high boiling fraction) will remove most of the naphthalene from the COG. Between two stages of wash oil scrubbing, chilled water from the bottom of the H_2S scrubber will cool the COG to 30°C (86°F). The naphthalenerich wash oil leaving the naphthalene scrubber will be processed in a light oil still; naphthalene will be recovered and the wash oil will be recycled to the scrubber.

1.90
From the naphthalene scrubber, the COG will enter a multi-stage H_2S scrubber (a modified Firma Carl Still design) where the H_2S content of the gas will be reduced from 5,720 to 850 milligrams per normal cubic meter (250 to 35 gr/100 scf) by absorption in lean ammonia liquors. Ammonia liquor feeds of increasing concentrations will be supplied to the various stages: from the bottom leg of the free ammonia still; from the deacifier; and by a split stream from the ammonia fractionator feed.

1.91
The H_2S-free COG will then be scrubbed of residual NH_3 by a phosphoric acid solution in the Phosam I absorber. Next, in two light oil scrubbers operating in series, a recirculating wash oil stream will remove almost 90 percent of the light oil remaining in the COG. This wash oil stream will be combined with wash oil from the naphthalene scrubber and stripped of light oil in the light oil still. (Light oil is a blend primarily of benzene, toluene, xylene, and naphthalene; it will be shipped from the plant for further processing). The clean COG leaving the light oil scrubbers will still be rich in hydrogen and methane and have a heating value of 4,893 kcal, Nm^3 (520 Btu/scf). Some of the COG will be used to enrich the BFG underfiring the coke oven batteries. The remainder will supply much of the gas used for the fuel requirements of the rest of the Lakefront Plant. A COG holder will exist at the proposed Lakefront plant. If there is ever any surplus COG it will automatically be released and ignited at a flare stack.

1.92
The H_2S removed from the COG in the H_2S scrubbers is recovered in the deacifier, along with all of the CO_2 and HCN, and part of the NH_3 in the lean ammonia liquor scrubbing solution. Low-pressure steam and steam vapors from the ammonia still will strip these volatile compounds and carry them to the Phosam II scrubber: there, ammonia will be separated from the other gases by the phosphate scrubbing solution. A water-cooled condenser downstream of the Phosam II scrubber will remove much of the water from the vapor

stream before the H_2S and HCN are burned in a Claus furnace, producing SO_2, CO_2, and N_2. Studies are underway to determine whether the proposed plant should recover the SO_2 as 93 percent sulfuric acid or convert it to molten sulfur; either product would be sold and shipped from the plant. If acid is produced, the SO_2 will be cooled, converted to SO_3 and absorbed in water in double absorption towers to produce concentrated sulfuric acid. The final uncondensed gases from the absorption towers will be discharged through a demister to a 30-meter (100-ft.) high stack. If molten sulfur is to be produced, the gases from the Claus converter will be passed through three catalytic reactor beds for conversion into molten sulfur. The tailgas from the reactor beds, after cleanup, will be discharged from a 30-meter (100-ft.) high stack.

1.93
The ammonia removed from the COG by the flushing liquor and by the aqueous washers in the H_2S and naphthalene scrubbers is largely recovered in an ammonia still. In case the ammonia still is inoperable, the deacifier can be used as an ammonia still. However, no H_2S free water (normally provided by the feed to the ammonia fractionator) can be returned to the top of the H_2S scrubber, so the H_2S concentration in the COG will be higher than normal in this mode of operation. That portion of the deacifier underflow not recycled to the H_2S scrubber, plus excess flushing from the contaminated water storage tank enters the upper portion of the ammonia still where LP steam strips the free ammonia from solution. Part of the stripped solution goes to the H_2S scrubber and the remainder is combined with the bottom stream from the ammonia fractionator and proceeds to the fixed ammonia still. There, lime addition promotes the stream stripping of residual ammonia. The water from the bottom of the fixed ammonia still, 1.6 million liters (423,000 gal) per day, goes to the waste water treatment plant. The vapors from the ammonia still pass through the deacifier, and the ammonia is recovered in the Phosam II scrubber by absorption in the phosphate scrubbing solution from the Phosam I ammonia scrubber. The resulting ammonium phosphate solution passes through a small aeration tank for removal of tar. Steam stripping removes the NH_3 from solution and yields a dilute aqueous ammonia condensate which is concentrated to 99.99 percent anhydrous ammonia in the ammonia fractionator. The anhydrous ammonia would be sold on the open market and shipped from the plant. In case the Phosam anhydrous ammonia plant is inoperable, it is possible to remove the greatest part of the ammonia in the H_2S scrubber and then burn the vapors from the top of the deacifier in an emergency incinerator.

Lime Plant

1.94
Burnt lime will be used by the proposed steel plant in the basic oxygen steelmaking furnaces. Burnt lime is produced by calcination of limestone in rotary kilns. There are two basic types of limestone used for lime manufacture: high-calcium limestone, which contains less than five percent $MgCO_3$ (magnesium carbonate) and dolomitic limestone which contains a combination of carbonates of calcium and magnesium. Only high-calcium limestone will be used in the proposed plant. The calcination of high-calcium limestone is shown below.

$CaCO_3$ (limestone) + 1,100-1,300°C (2,000-2,400°F) CaO (quicklime) + CO_2

The air pollution control system of the lime plant will be characteristic of the most modern in the industry. Exhaust gases from the twin kiln lines will be cooled as they are passed through the preheater and finally to a gas-cleaning system and cleaned to 0.024 g/Nm^3 (0.01 gr/scf). The gases extracted from the storage bins, transfer points, and roller mill will also be cleaned to 0.024 g/Nm^3 (0.01 gr/scf) before being exhausted to the atmosphere.

a) *Plant Capacity*

1.95
The lime plant will process about 120 tonnes (132 tons) per hour of limestone with potential maximum of 138 tonnes (152 tons) per hour. It will produce about 540,000 tonnes (600,000 tons) per year of calcined or burnt lime. The calcined product will be consumed in the steelmaking shops. The lime plant which will screen limestone feed will supply 114,000 tonnes (125,000 tons) per year of less than 1/2-inch undersize to be consumed in the sinter plant mix.

b) Raw Materials Storage

1.96
The limestone storage yards will be located at the west end of the plant and will provide open storage for a capacity of 325,000 tonnes 358,000 tons). This is equivalent to a storage capacity of about 90 days of limestone requirements. The location of the limestone storage yards will be adjacent to the ore storage area at the west of the proposed plant. The average composition of the limestone is 95 percent, $CaCo_3$ and 3-4 percent moisture.

c) Raw Materials Transportation

1.97
Limestone from storage in the main raw materials storage yards will be transported by belt conveyors to the burnt lime plant which will

be located near the sinter plant and the steelmaking shops to minimize conveyor lengths for product transport. A 2,000-tonne (2,200-ton) storage bin will provide a surge capacity of about 12 hours. Limestone will be removed from the storage bins by a vibratory feeder and transported by a 75-centimeter (30-in.) belt conveyor to a 13-millimeter (1/2-in.) single-deck vibratory screen. The expected split between greater than 13 millimeter and less than 13 millimeter is estimated to be 90 percent between 57 millimeters (2-1/4 in.) and 13 millimeters. The balance (10 percent) will be less than 13 millimeters. The limestone received will be such that it meets this desired split. The 13 millimeter fraction will be shipped by belt conveyors to a storage bin in the sinter plant. All major transfer points will be hooded to reduce emissions. Significant transfer points within buildings will also be hooded and emissions directed to baghouses. The emissions from the baghouses will exit through stacks. Conveyor belts will be covered to reduce emissions.

d) Lime Plant Preheating

1.98
Limestone from the +13 millimeter (+1/2 in.) storage bin will be charged at about 60 tonnes (66 tons) per hour to each packed preheater. The preheaters will be of the Kennedy Van Saun Shaft type, or equivalent. The preheater dries, preheats, and partially calcines the limestone. The preheater is a refractory-lined box mounted between the raw feed bin and the kiln. Hot gases are drawn through and preheat the stone to about 820°C (1,500°F). The retention time of the limestone is about two hours during which time 10 percent - 20 percent skin calcination is accomplished. Hot precalcined limestone at about 820°C (1,500°F) is fed to the kiln by means of multiple plungers through an alloy steel pipe or refractory-lined feet spout. The off-gases from the lime preheater will be introduced into a cyclone followed by a baghouse to remove particulates from the gas stream. The off-gases will leave the baghouse at about 200°C (390°F) and finally exhaust through 30-meter (98-foot) stack. They will contain no more than 0.024 g/Nm^3 (0.01 gr/scf) of particulates. The dust collected in the cyclone and baghouse will be transported to the waste dump. A part of the dust, however, may be used for plant wastewater treatment.

e) Calcining

1.99
The calcining at the proposed lime plant will be carried out in two counter flow refractory-lined rotary kilns fired with COG. No. 2 oil with low sulfur (about 0.2 percent S) will be used as a backup fuel in emergency when COG is not available. The normal firing rate of each kiln is about 46 million kcal (185 million Btu) per hour. Its

maximum firing rate is about 65 million kcal (260 million Btu) per hour. Each kiln will treat 1,500 tonnes (1,650 tons) of limestone and produce about 800 tonnes (880 tons) of lime per day. As the kiln slowly rotates, new surfaces of stone are exposed to the hot gases. The radiation heat transfer between gases, limestone, and refractory wall play an important part in the calcination process. In the kiln, the limestone up to 2,400 millimeters (2-1/4 in.) size is heated to about 1,200-1,300°C (2,200-2,400°F) for calcining.

f) Cooling

1.100
The hot calcined limestone will be discharged at about 1,100°C (2,000°F) from the rotary kilns and cooled in two Niems-type contact counter flow coolers. This is the most common type of cooler used in industry today. It is a refractory-lined enclosure mounted below the kiln hood; temperature to 55°C (130°F) or less. At this temperature, the calcined lime can be safely handled by rubber conveyor belts. The hot air exiting the coolers will be used as secondary combustion air in the rotary kilns. This scheme will recover the thermal energy in the hot air stream and reduce the overall energy requirements of the lime plant. The cooled lime from the coolers at about 40-55°C (100-130°F) is transported on rubber belt conveyors to a set of covered storage bins. The bins will provide about five to six days of surge capacity. Gases with entrained dusts will be collected from the lime cooler discharge point and exhausted through a baghouse to remove the dust which will be transferred to the lime storage bins. From there, it will go to the roller mill for grinding along with the main stream of lime. The cleaned gas from the baghouse will be exhausted to the atmosphere.

g) Milling

1.101
The calcined and cooled lime will be extracted from the storage bins by belt feeders onto rubber belt conveyors to be fed to a roller mill where it will be crushed and ground. The ground product from the roller mill will be fed to an air classifier that will separate material that is less than 1,000 microns (0.04 in.) from material that is greater in size than 1,000 microns. The roller mill and the air classifier are in closed circuit. Therefore, that portion of the lime from the air classifier greater than 1,000 microns in size will always be sent back to the roller mill for further grinding. The dust from this stream will be removed by a baghouse and cleaned gas will be discharged to the atmosphere through a 30-meter (98-foot) high stack. The dust collected from the baghouse will be recycled to the ground product stream. The resultant lime product is pneumatically transported to a covered storage bin for use in the Q-BOP shop.

Sinter Plant

1.102
The blast furnace is a counter current, gas-solid reactor in which the solid charge materials, called burden, are moving downwards while the hot gases are flowing upward. The solid materials must meet very stringent physical and chemical standards for the furnace to operate properly. Homogeneity of the solid particles in chemical composition and size and shape are very important to insure an even and efficient process. The best possible contact between the solids and the reducing gas is obtained with a porous and permeable burden which permits not only a high rate of gas flow but also a uniform gas flow with a minimum of channelling and inefficient use of the reducing gas. In order to make the fine iron ores permeable and suitable for the blast furnace, the iron ore charge should be agglomerated within the 6 to 50 millimeter (1/4 to 2 in.) range. Sintered fine iron ore has permeability, strength, and mineralogical characteristics suitable (as charge) to the blast furnace. The use of sinter in the blast furnace results in significant improvements in furnace performance. A schematic of the sintering process is shown in Figure 1-10.

1.103
In general, sintering of fine iron ore, dusts and millscale is a gas-solid process for heating ore fines and other iron oxides to produce an iron ore aggregate suitable for charging to the blast furnace. In the proposed plant, the sinter will be of the self-fluxing type, i.e., the limestone requirements of the blast furnace will be included in the sinter mix. This makes for a more homogeneous burden. Also, the limestone is calcined on the sinter strand rather than in the blast furnace, which decreases the coke requirements and increases the productivity of the blast furnace. In sintering, the mixed iron ore fines, dusts, and additives, together with solid fuel, are laid down on a moving grate as a bed of uniform thickness, and suction is applied beneath the grate. The coke on the top of the bed is first ignited and hot combustion gases are drawn through it rapidly raising temperature of the top layer to about 1,320 to 1,500°C (2,400 to 2,700°F). By the time the ignition period is finished, the solid fuel (coke) at the top of the bed has reached sufficient temperature to sustain combustion. Sintering proceeds as the combustion zone move downward through the bed. From this point onwards, air is sucked down through the bed. The air is first preheated by its passage through the upper layers of the bed, then sustains combustion of the hot carbon, and finally is rapidly cooled by evaporating the water from the bed immediately below the combustion zone. This gas leaves the bed and passes through the windboxes as waste gas into the exhaust duct.

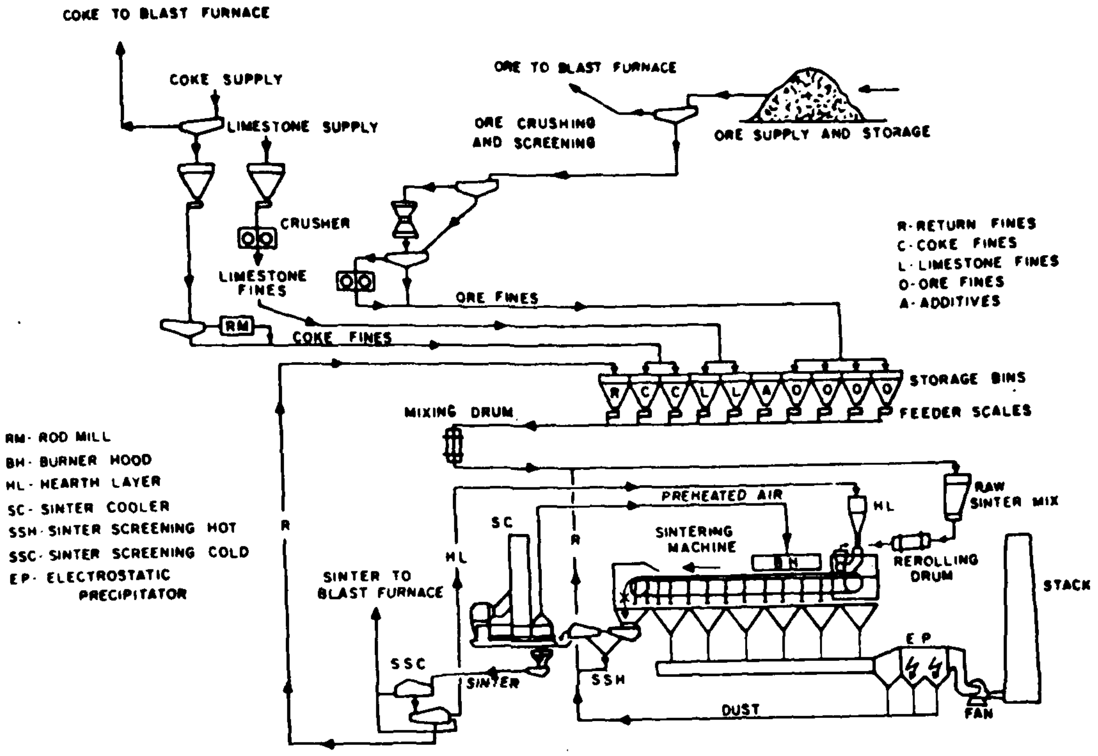

Figure 1-10 SCHEMATIC OF A CONVENTIONAL SINTER PLANT INSTALLATION

1.104
At the conclusion of the process all the fuel has been burned and each level of the bed has, in turn, been heated to the sintering temperature. Next the sinter is tipped, crushed, and screened and the undersize material is cleaned out while the oversize is air cooled and rescreened. The oversize from the rescreening goes to the blast furnace and the undersize is recycled. Plant tests have demonstrated significant increases in iron production rate as a result of screening out small sized material before it is charged to the furnace. The sintering operation can take place as a batch process or as a continuous process. Present day large-scale operations like the 3.44 million tonne (3.78 million ton) capacity sinter plant planned for the proposed plant use the continuous Dwight Lloyd process. It involves charging the bed onto a moving grate and passing it under an igniter with a downdraft to pull the air through the bedded grate.

a) Coke Preparation Section

1.105
While other fuels, such as powdered anthracite, may be used in special circumstances, coke breeze is considered the best and most widely employed sintering fuel. In an integrated iron steel works such as the one proposed by the applicant, the main source of coke is the undersize, or "breeze," produced in the production of blast furnace coke of the appropriate size range. A coke preparation facility will be installed to grind the undersize coke breeze screened from coke at the blast furnace to the size of less than three millimeters (0.12 in.) required for sintering. The coke breeze from the blast furnace stockhouse will be transported by covered belt conveyors to the coke preparation building and will be stored in silos having a 12-hour capacity, i.e., 5,000 tonnes (5,500 tons). The coke will be fed from silos at a controlled rate of about 410 tonnes (450 tons) per hour by a weigh belt feeder and screened on a three millimeter (0.12 in.) single deck rotary type screen. It will be housed in a unit in which a COG flame will be burning to keep the screen cloth dry and prevent screen blinding. This flame will be located at the bottom corner of the housing adjacent to the empty quadrant of the rotary screen. A conveyor beneath the screen will catch the undersize while a conveyor at the discharge end will catch the oversize. The fraction of material greater than 3mm (0.12 in.) in size will be crushed in a gyratory crusher while that portion of the material less than 3mm in size will be conveyed to a product storage bin. The crusher discharge stream will be recycled to the screen along with the new feed. The product will then be conveyed from the storage bin either to the blending plant or to the sinter plant bin.

b) Blending Plant

1.106
In order to produce a homogeneous sinter product, it is necessary to blend the sinter plant feed mix prior to sintering. In the design of the proposed plant, every effort will be made to provide a consistent feed mix to the sintering operation. Various types of equipment can be employed for blending the sinter charge mix. At the proposed plant, each component of the sinter mix will be transported by covered conveyor and distributed uniformly along the length of the blending pile, which is of conical section. A pile of known chemical composition can be built by feeding calculated weights of materials of known composition. The material is then reclaimed by taking successive slices across the pile, each of which should have the same analysis and size grading.

1.107
Ore, limestone, and dolomite from the raw material storage yard and pellet screenings from the blast furnace stockhouse will be transported to the blending plant by covered belt conveyors. In-plant recycled materials such as blast furnace flue dust and sludge, millscale, metallic fines, and BOP slag, will be trucked to the blending plant site, dumped onto a concrete pad and introduced to a belt conveyor system by front-end loader for transportation to the bins. Coke will be transported by belt conveyor from the coke grinding building.

1.108
All of these materials will be fed from the respective bins via weigh belt feeders to a collecting belt conveyor. The feed rate of each material is controlled by a computer so that the chemical analysis of the mixture is held constant at a predetermined level. The computer will also adjust feed rates to maintain a constant chemical analysis as one or more bins are used to feed different materials.

1.109
The mixture of materials on the collecting conveyor will be transported to a stacker which discharges it to the blending pile. The pile will be built at the rate of 2,500 tonnes (2,750 tons) per hour as the stacker moves along the length of the pile. Two piles of 80,000 tonnes (88,000 tons) each will be used alternately. Each pile will be 35 meters (115 ft.) wide and 210 meters (690 ft.) long. Each pile will provide a surge capacity for about eight days of sinter plant requirements. Blended material pile will then be reclaimed by a drum reclaimer at a rate of about 1,000 tonnes (1,100 tons) per hour. The reclaimed material falls from the buckets on the drum to a belt conveyor that travels through the center of the drum. From this conveyor the blended material is conveyed to the sinter plant. The

materials that are blended include all of the blast furnace flue dust and sludge, dolomite, BOP slag, mill scale, scrap fines, pellet screenings, and about 70 percent of the limestone and coke required in the sinter mix.

c) Raw Materials in Sintering

1.110
The blended material from the blending plant is transferred by belt conveyor from the stockyard and stored in a series of sinter plant bins. The coke fines, limestone and dolomite fines, and blast furnace sinter screenings are also transported by conveyor belts to the top of the sinter plant bins and stored in separated bins. Sinter plant bins for the various feed materials are sized to hold a twelve-hour supply of materials except for the bin that stores recycle sinter fines. In that case, the bin has a three-hour holding capacity. The capacity in the various sinter plant bins is shown in Table 1-11.

1.111
The tops of the blast furnace sinter screening and the sinter recycle bins are enclosed by dust pickup hoods to prevent escape of dust particles during filling of the bins. The required amount of the various components for the sinter plant feed are drawn from the bins by weigh belt feeders onto a collection conveyor. The belt feeders are also covered with pickup hoods where necessary to prevent the escape of fugitive dust during the discharge of the feed from the bins to the collecting conveyor. The tonnages and percent of constituents in the sinter mix for maximum and average production rates are shown in Table 1-12.

d) Mixing

1.112
Although simple in principle, sintering plants require that a number of important factors in their design and operation be observed to obtain optimum performance. Intimate mixing is one of the most important. In order to achieve this, after the individual raw materials have been correctly proportioned onto the collecting conveyor for sintering they will be charged to a drum mixer. In the drum mixer, the charge mix will be converted into rice size small balls that ensure sufficient permeability of the sinter bed. Since the moisture content for balling of the sinter mix is quite critical, it will be extensively monitored and controlled. The correct water addition will be assured by an automatic control system to measure the moisture content of the sinter mix at the discharge end of the drum. The drum mixer will be provided with baffles to prevent buildup on the shell surface and the internal surface of the drum

Table 1-11

Sinter Plant Bin Capacities

Material	Bin Capacity		
	Hours of Supply	Quantities	
		Tonnes	(Tons)
Sinter Plant Blend	12	5000	(5500)
Coke Fines	24	1000	(1100)
Stone (Limestone & Dolomite)	12	270	(300)
Blast Furnace Sinter Screening	12	600	660

Source: United States Steel Corporation.

Table 1-12

Sinter Mix Constituents

	%	Tonnes (Tons) Per Day	
		Average	Maximum
Ore	64.8	7114 (7825)	8085 (8894)
Pellet Fines	1.8	202 (222)	230 (253)
Flue Dust	1.3	142 (156)	161 (177)
Scale	3.5	374 (381)	426 (469)
Limestone	4.3	476 (524)	541 (595)
Dolomite	1.4	152 (167)	173 (190)
BOP Slag	6.3	688 (757)	782 (860)
Blast Furnace Sinter Screenings	9.2	1012 (1113)	1150 (1265)
Manganese Ore	0.6	71 (78)	81 (89)
Coke Breeze	6.8	749 (823)	851 (936)

Source: United States Steel Corporation.

will be protected against abrasion by lining plates. The drum mixer will have a length/diameter ratio of about 5:1. New feed material will be introduced at one end of the drum where the water sprays are located. The slope of the mixer and its speed will be adjustable to achieve the desired residence time of about five minutes. The mix will discharge from the exit end of the drum mixer onto a conveyor belt and be transported to the sinter machine.

e) Sintering

1.113
The annual sinter production for the proposed facility is projected at 3.44 million tonnes (3.78 million tons) of sinter product or 420 tonnes (465 tons) per hour. The 4-meter (13-ft.) wide sinter machine for the proposed plant will be essentially an adaption of the Dwight Lloyd sinter strand, one of the most common types of modern sintering operation. The prepared sinter mix from the drum mixture is belt conveyed to a surge hopper at the charge end of the sintering machine. The surge hopper has a capacity of 75 tonnes (82 tons) and provides storage for about six minutes. The prepared mix from the balling mixer will then be fed carefully from the hopper to the grate of the sintering machine by a rotating roll feeder to provide a uniform, homogeneous bed and to prevent compacting of the bed. Use of the roll feeder provides a very uniform feed which can be closely controlled in quantity by varying the outlet gap from the hopper or the speed of rotation of the roll. A strike-off plate will be provided to form a level bed with uniform height of the sinter of about 400 millimeters (16 in.). Conductance probes behind the strike-off plate will measure the depth of material there, and a signal generated by these probes will be used to adjust automatically the speed of the roll feeder for controlling the depth of the bed.

1.114
A 25-millimeter (1-in.) deep hearth layer of 25 millimeters X 15 millimeters (1 in. X 0.6 in.) sinter will be deposited on the sinter machine grates prior to charging the sinter mix. The hearth layer material will be fed by a roll feeder to the moving strand from a hopper fitted with an adjustable gate. Use of the hearth material serves to protect the grates of the machine from excessive heat, minimize the amount of sinter fines that fall into the gas chamber through the grates, and prevent the sinter from sticking to the grates. After passing under the strike-off plate, the sinter bed is ignited to start the combustion of the solid fuel in the bed. The refractory-lined ignition furnace will be divided into two sections of equal length. Each section is about 4-meters (13 ft.) long. The first section is located at the top of the bed and is brought to a temperature of about 1,400°C (2,550°F) to sinter the top layer of the raw sinter feed as well as to ignite the solid fuel. The ignition

burner in this section is fired at the rate of about 18 x 10^6 Btu) per hour with residence time of the sinter under the ignition furance running about two minutes. Generally, the ignition furnaces are fired with COG, but low sulfur No. 2 oil will be available as a standby energy source.

1.115
During and after the ignition, air drawn through the sinter bed to support combustion of solid fuel transfers the heat from the top to the bottom of the bed. The products of combustion along with the moisture and other substances vaporized in the bed are drawn into the windboxes beneath the sinter machine. These gases then flow from the windboxes through windlegs into a collector main, on to cyclones and wet electrostatic precipitator gas cleaning equipment where it finally exits through eighteen 30-meter (98-ft) high stacks to the atmosphere. The cyclones will remove the bulk of the coarse solids from the gas stream and provide protection for the exhaust fan and recycle them back into the process via the sinter return bin. The gases leaving the cyclones will be cleaned in 18 wet electrostatic precipitators resulting in the removal of 99 percent of the remaining particulate materials and a portion of the sulfur dioxide gas contained in the gas stream. The underflow from the wet electrostatic precipitators will be treated in classifiers. The overflow from the classifiers will be returned to the precipitators, and underflow will be pumped to the plant central treatment system from which makeup water will be obtained.

1.116
Dust that becomes airborne at the top of and bottom of various bins, at the feed and discharge end of the sinter machine will be collected and cleaned through a baghouse. All dust collected will be recycled back into the sinter process. Pertinent specifications for the sintering machine are presented below:

Length: 96 meters (315 ft)
Width: 4 meters (13 ft)
Area: 384 square meters (4130 sq ft)
Number of windboxes: 12
Discharge volume: 23,560 Nm^3/m (880,000 scfm)
Hourly production: 420 tonnes (465 tons) sinter
Strand speed: 4 meters/minute (13 ft./minute)
Sinter machine annual capacity:
    4,300,000 tonnes (4,730,000 tons) raw mix
    3,440,000 tonnes (3,784,000 tons) sinter product
    3,080,000 tonnes (3,390,000 tons) product transferred

f) Sinter Processing and Handling

1.117
The sinter discharged at the far end of the sintering machine will have a temperature of about 700°C (1,300°F). Hot sinter will fall from the machine to a crash deck and from the crash deck to a sinter breaker. The material from the sinter breaker will pass through a 150-millimeter (6 in.) grizzly where particle sizes are reduced top 150 mm (6 in.) or less. From the grizzly the sinter will then fall through a chute and into a rotary cooler. The rotary cooler is a circular pan type conveyor with forced draft cooling. A pan dump point is built into the track at a point approximately 350° from the load point. The cooler which has a 1.5 meter (4.9-foot) deep bed provides one hour retention time for the sinter which is discharged at a temperature of about 100°C (212°F) or less. At this point the material is now cool enough for safe handling on rubber belt conveyors. The cooled sinter is passed across a scalping screen where particles larger than 50 mm (2 in.) are separated from those that are smaller. The fraction that is larger than 50 mm (2 in.) is directed into a single stage roller where it is crushed to a size equal to or less than 50 mm. The entire sinter stream is then screened on successive 25 mm, 15 mm, and 5 mm mesh single deck vibrating screens. Material ranging in size from 5 mm to 50 mm is sent to the blast furnace stockhouse. The fraction ranging in size from 15 mm to 25 mm will be diverted for use as hearth layer on the sintering machine, while particles smaller than 5 mm will be recycled to the sintering process as sinter fines. Dust that becomes airborne at the sinter handling conveyor transfer points and at the sinter crushing and screening operations will be collected at each location by a baghouse. The collected dust will then be conveyed to the sinter return bins by screw and/or belt conveyors for recycling. The cooled, crushed, and sized sinter will finally be conveyed to the blast furnace stockhouse sinter storage bins by enclosed belt conveyor.

Blast Furnaces

1.118
Hot metal, also called molten pig iron, for refining to steel will be produced in two very large, modern blast furnaces. These two identical furnaces will be built one after the other, the second furnace being part of Phase II of the plan construction. Each furnace will produce 3,250,000 tonnes (3,580,000 tons) of hot metal per year or an average of 9,300 tonnes (10,200 tons) per day on the basis of 350 operating days/year. (Fifteen days are scheduled for shutdown and maintenance.) Each furnace will have a hearth diameter of 14.4 meters (47.2 ft.), an overall height of 100 meters (328 feet) and an inner volume of 4,600 cubic meters (162,000 ft.^{3}).

1.119
A blast furnace, as shown schematically in Figure 1-11, is a large vertical counter-current reactor. Iron-bearing materials (lump ore, pellets, sinter, scrap) are charged at the top of the furnace, together with coke and fluxing agents (limestone, lime or dolomite). These solid materials are called the burden. Hot air (called the wind or the blast) is blown into the bottom of the furnace through tuyeres. The hot air burns the coke, thus generating enough heat to melt the rest of the charge. These combustion gases are rich in carbon monoxide (CO) and also contain a small quantity of hydrogen (H_2) formed by the decomposition of the water vapor contained in the blast. As the burden moves downward through the furnace, it is heated by the hot ascending gases, and the iron oxides are reduced by the CO and H_2 in the gas to form metallic iron, carbon dioxide (CO_2) and water vapor (H_2O). As the burden descends further, the temperature continues to rise and melts the metallic iron and the slag resulting from the reacting of the residual gangue with the flux. The molten iron and slag form two immiscible liquids which are collected at the bottom of the furnace and are periodically removed. The slag floats on the higher density hot metal.

1.120
The hot metal consists of liquid iron saturated with carbon and containing smaller quantities of dissolved silicon, manganese, phosphorus, sulfur, and minute other quantities of elements. The slag contains most of the oxide impurities present in the ore as gangue, in the coke as ash, as well as the fluxing agents and some dissolved refractories. The operating temperature profile of the furnace and the chemistry of the slag are very important in controlling the quality of the hot metal and productivity of a furnace. In particular, a good slag is fluid and "basic," having the capability of retaining most of the sulfur entering the blast furnace with the coke. To obtain this effect, such basic constituents as dolomite or lime are added to the burden.

1.121
The furnace will be cast approximately 12 times per day. In order to remove the iron and slag, a small hole approximately 50 mm (2 in.) in diameter is drilled through the furnace wall into the hearth. First the iron and then the slag flow out through this hole into the iron trough. The iron trough is approximately 0.5 meter (20 in.) wide and 20 meters (65 ft.) long. In this trough, the iron and slag separate with the slag floating on top of the iron. The slag is skimmed off and carried through runners to a granulation facility or to a standby open dry slag cooling pit. The iron flows by gravity in runners and is collected in ladles underneath the cast house floor.

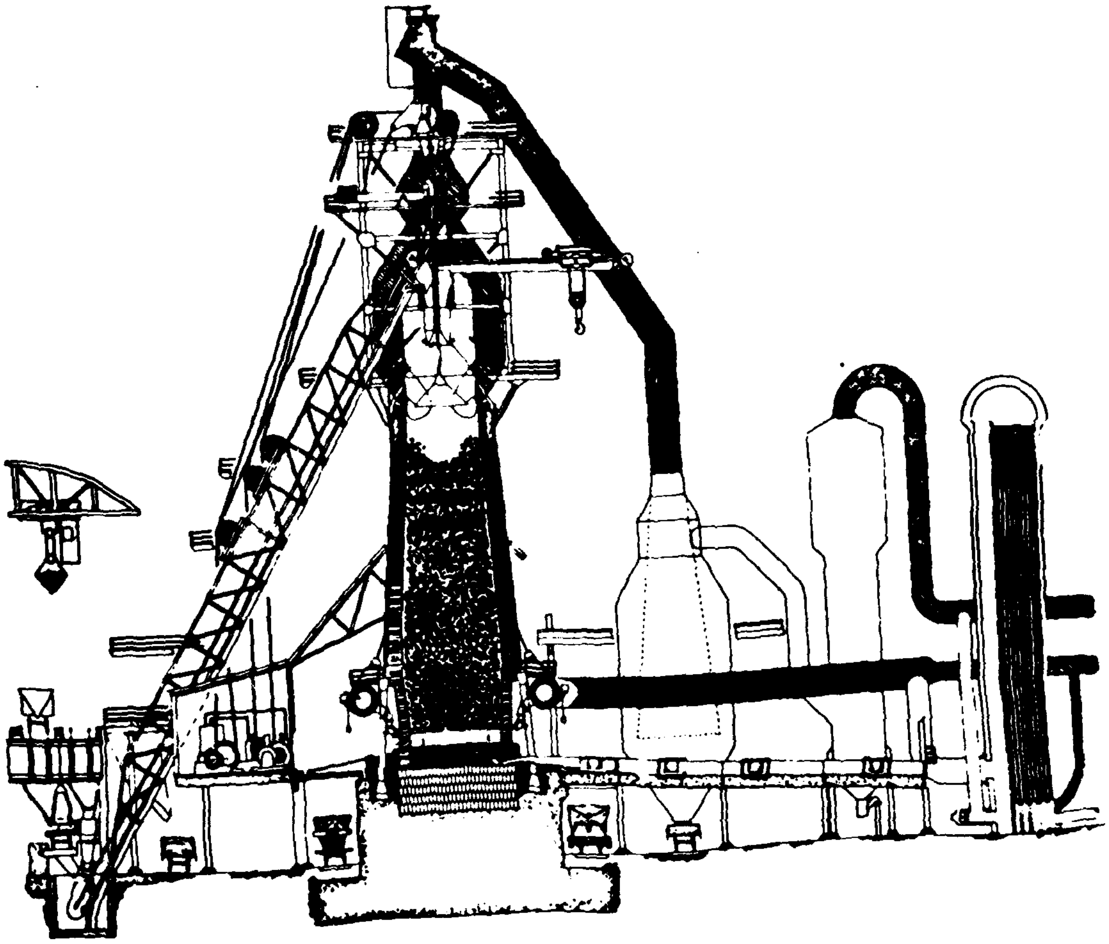

Figure 1-11 SCHEMATIC OF A CONVENTIONAL BLAST FURNACE

1.122
The blast furnace gas (BFG) leaving the top of the furnace is sent to a settling chamber or dust catcher, where the larger particles contained in the gas drop out by simple gravity as the velocity of the gases is reduced. The BFG is then cleaned in a high energy venturi scrubber and cooled to remove any moisture. Typically, cleaning decreases the dust loading in the gas to the range of 10-15 mg/Nm^3 (0.004-0.006 gr/scf). The clean, cooled BFG still contains enough CO and H_2, to represent about 615 to 745 cal/m^3 (75 to 85 Btu/ft^3). Therefore, the recovered BFG is utilized as a fuel in blast furnace stoves to preheat the blast air, in steam boilers, in coke ovens for underfiring and other furnaces throughout the steel plant. The fuel distribution system of the plant calls for maximum energy conservation: less than one percent of the BFG will be flared (i.e., burned and released to the atmosphere).

1.123
The new furnaces built at the proposed plant will operate under high top pressure: the gases will leave the furnace at two to three kg/cm^2 (30-45 psig). The compressed gas will be used to drive an expansion turbine which in turn will be used to drive an electrical generator. In this manner, the energy spent to compress the blast is partially recovered as electricity. As in most integrated steel plants, the blast air is supplied by large compressors driven by a steam turbine. The steam is produced by the boilers that burn BFG. The air is then heated in a regenerative type stove to a temperature between 1,000° and 1,250°C (1,830-2,300°F) before being blown into the furnace through the tuyeres. Each furnace will have four stoves. These stoves will normally be operated with one of the stoves heating the blast air and three of the stoves being heated by burning BFG enriched with COG and being sequentially readied to replace the stove on blast when it cools.

a) Stockhouse

1.124
The stockhouse will be located approximately 350 meters (1,240 ft.) from the furnace and will consist of a collection of bins and silos for storing raw materials for charging to blast furnace. Bins will be provided for sinter, pellets, coke, limestone, dolomite, and miscellaneous materials such as manganese or BOP slag. These bins will have 16-24 hours storage capacity for each raw material. All materials will be received at the stockhouse by conveyor belt. At the top of the bins, there will be a series of trippers and shuttle belts for feeding the materials into the correct bins. At the bottom of each bin will be a vibrating feeder and a collecting belt which will convey the materials to a vibrating system. After screening, the materials will be collected in a weigh hopper. There will be

separate screens for each material and the weigh hoppers will be arranged so that they can discharge materials onto a main conveyor belt to the top of the blast furnace.

1.125
The operation of the stockhouse will be controlled by a computer which will select the correct sequence and weight of each material to be charged to the furnace. The normal burden for these furnaces is shown in Table 1-13 and contains approximately the following quantities of materials daily: 10,000 tonnes (11,000 tons) of pellets, 4,200 tonnes (4,600 tons) of sinter, 3,600 tonnes (4,000 tons) of coke, 85 tonnes (94 tons) of limestone and dolomite, and miscellaneous materials (mainly iron and steel scrap having a high degree of oxidation). All materials will be screened prior to charging to the furnace. Sinter, pellets, and miscellaneous materials will be screened at 5 millimeters (0.2 in.) and coke will be screened at 25 millimeters (1 in.). The fines that will be removed during this screening operation will be collected and stored in small surge bins in the stockhouse and subsequently will be transported by conveyor belt to the sinter plant blending bins. It is estimated that three percent to five percent of the pellets, five percent to 10 percent of the sinter, and five percent to 10 percent of the coke will be removed during the screening operation. The normal and maximum material feed rates and outputs for each furnace are shown in Table 1-13.

b) Furnace Top

1.126
The furnace top is a new technical development of the Paul Wurth Co. of Luxembourg. It is widely used in Europe and replaces the previous double bell system in modern blast furnaces. A complete description of this system can be found in a recent article by Legille. (See Reference 1-4) The conveyor from the stockhouse will discharge the raw materials into one of two receiving hoppers at the top of the furnace. Each of these receiving hoppers will have a capacity of approximately 50 cubic meters (1,760 cubic feet). While one of the hoppers is being filled, the other hopper is being pressurized to the pressure prevailing inside the furnace. This pressurizing is done by introducing nitrogen into the receiving hoppers. (Nitrogen will be supplied by the air separation plant, which is primarily operated for production of oxygen for use in steelmaking operations.) The pressure inside the furnace at the top will be between 2.0 and 3.0 kilograms per square centimeter (30-45 psig). When the pressures are equalized, material gates and valves open at the bottom of the receiving hopper, and the materials flow into the furnace through a rotating chute. This rotating chute distributes the material uniformly or in any other desired pattern to ensure proper operation of

Table 1-13

Materials Balance of a Single Blast Furnace

Input and Output Operating Estimates of a Single Blast Furnace

	Units	Average	
INPUT			
Burden			
Fluxed Sinter	Tonnes (Tons) Per Day	4,200	(4,630)
Pellets	Tonnes (Tons) Per Day	10,000	(11,000)
Coke	Tonnes (Tons) Per Day	3,600	(4,000)
Flux	Tonnes (Tons) Per Day	85	(94)
Wind	Nm^3/hr (scfm)	485,000	(301,000)
Injected Fuel	Tonnes (Tons) Per Day	637	(702)
OUTPUT			
Top Gas	Nm^3/hr (scfm)	630,000	(391,000)
Dust and Sludge (15 kg/tonne)	Tonnes (Tons) Per Day	140	(154)
Hot Metal	Tonnes (Tons) Per Day	9,300	(10,200)
Slag	Tonnes (Tons) Per Day	3,000	(3,300)
Runner Scrap	Tonnes (Tons) Per Day	85	(93)

Source: United States Steel Corporation.

the furnace. When the receiving hopper is empty, the valves are closed and a relief valve opens to the atmosphere to depressurize the receiving hopper. This hopper is then ready to receive the next charge and the other hopper is pressurized for subsequent charging to the furnace.

c) Air and Fuel Injection

1.127

The wind will be preheated to between 1,000°C and 1,250°C (1,830° to 2,300°F) in regenerative stoves before being blown into the furnace through the tuyeres. The moisture content of the wind will be adjusted to a constant level close to one percent and no provision is made for oxygen enrichment. Fuel oil will be injected through the tuyeres at a rate of 75 kilograms per ton (150 lb/short ton) of hot metal. The stoves will be fired at a maximum fuel rate of 404,000 Nm^3/hr (250,000 scfm) of BFG enriched with 56,000 Nm^3/hr (34,700 scfm) of COG.

d) Blast Furnace Gas Cleaning

1.128

BFG is recovered to be used as a fuel in several locations of the plant (Table 1-14). The BFG cleaning devices are therefore usually considered to be part of the production equipment rather than pollution control devices. The BFG, leaving the top of the furnace at approximately 10,500 Nm^3 (391,000 scf) per minute, is removed through four large pipes called uptakes. These are then joined together to form a single large pipe called the downcomer. The downcomer carries the gas into a gravity settling chamber, the first dust-cleaning device, which is a large cylindrical tank approximately 15 meters (49 ft.) in diameter and 30 meters (98 ft.) high with a simple change in direction and is called a dust catcher. Most of the large dust articles are removed by this unit. The gas is then cleaned in a primary venturi scrubber. This scrubber provides a gas with a cleanliness of approximately 100 mg/m^3 (0.04 $gr/ft.^3$). This semi-clean gas is then piped to a top gas energy recovery turbine. The pressure in the gas is used to drive this recovery turbine, which in turn drives an electric generator. The gas is then conveyed to the secondary venturi scrubber where it is cleaned to a final cleanliness of 12 mg/m^3 (0.005 $gr/ft.^3$) before it is used elsewhere in the plant.

e) Blast Furnace Proper

1.129

The blast furnace will be lined with refractory varying in thicknesses of about 1,000 to 1,500 millimeters (40 to 60 in.). In the stack of the furnace the refractory lining will be a high duty

Table 1-14

Typical Use of Blast Furnace Gas in the Final Plant Layout

	Nm^3/Hr (1)	%
Blast Furnace Stoves	335,000	26.7
Power House Boilers	620,000	49.5
Coke Plant Underfiring	260,000	20.8
Hot Strip Mill Reheat Furnaces	24,000	1.9
Plate Mill Reheat Furnaces	8,000	0.6
Flared: (Max. 1%)	6,000	0.5
Total	1,253,000	100.0%

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(1) Nm^3/hr = 0.62 scfm

Source: United States Steel Corporation.

fire clay brick. The bosh and hearth lining will be of carbon refractory brick. The stack lining of the furnace will be cooled by copper plates embedded in the refractory lining. Bosh cooling will be accomplished with cast iron staves located between the refractory lining and the outside shell. These staves will be of the Russian type but will be operated in the recirculative cooling mode. Water for the staves will be pumped and recirculated through a heat exchanger loop. The hearth will be cooled with either staves or external channels. At this time, the exact method of cooling the hearth has not been determined.

f) Cast House

1.130
Each furnace will have four iron notches arranged in a roughly symmetrical pattern around the base of the furnace. Each iron notch will have an iron trough 20 meters (66 ft) long and one tilting spout. The iron trough will be handled by one of the two large electric overhead traveling (EOT) cranes. Periodically, the lining in the trough must be repaired. To do this, a spare trough will have been lined in a remote relining station and delivered to the cast house. The old, worn trough will be removed and the newly relined trough will be installed.

1.131
During the casting operation, the fumes and dust generated will be removed by a system of hoods and ducts over the tap-hole and the tilting spout locations. Between the tap-hole and the tilting spouts, all runners will be covered. The dust and gas collected in this system will then be cleaned in a baghouse before discharging to the atmosphere. The slag that is skimmed off the iron will be processed by quenching in an enclosed slag granulation facility. This granulation is accomplished by contacting the slag with a high velocity stream of water which disintegrates the slag into small particles and solidifies it. The water and slag slurry is then pumped to large settling tanks where the water is removed to drain into a collecting sump. The slag, after dewatering, will be carried by conveyor or truck to a slag processing area in the plant. The water in the sump will then be recirculated to the granulating tank and, if necessary, a small portion of the water will be cooled in a separate air cooling tower for removal of the heat generated in the process. The capacity of the slag granulation facility is sufficient to handle the expected rate of slag generation, i.e., 6,000 tonnes (6,600 tons) per day. The RASA, or an equivalent, system will be used, as described under Slag Granulation later in this section. For use during problems with RASA system or possibly during furnace problems, two dry slag beds have been provided on each side of the furnace. In these beds, the slag flows out in a thin layer during the cast and is

subsequently air-cooled. Water may be sprayed onto the surface of the bed of the solidified slag. The "Monkey" or slag notch arrangement, located approximately 1.5 meters (5 feet) above the iron notch, will not be used except possibly during startups and during serious furnace problems.

g) Hot Metal Transfer

1.132
In the proposed plant, the blast furnace will be located very close to the steelmaking shop. This arrangement is a so-called "close-coupled system." Hot metal from the blast furnace will be transferred to the steelmaking shop by transfer cars and EOT cranes. There are no railroad torpedo cars or locomotives for carrying hot metal. As described in the previous section, the hot metal at the blast furnace is cast into 300 tonne (330 ton) open top ladles under the cast house. These ladles will set on a transfer car that will be moved out from under the cast house into the hot metal charging aisle of the steelmaking shop. The cars will be self-propelled or pulled by a cable winch.

1.133
The hot metal charging aisle will be a building about 30 meters (100 ft) wide by 400 meters (1,300 ft) long. It will be located south of the steelmaking shop and will run parallel to the steelmaking charging aisle of the steel king shop. The hot metal charging aisle will have desulfurization facilities, slag skimming, a pig iron granulation plant and areas for ladle relining. It will have four large 400 tonne (440-ton) electric overhead cranes. As a ladle is filled, in normal operation, the hot metal spout will be tilted to fill a second ladle. The filled ladle on the blast furnace transfer car (No. 1) will move into the charging aisle, where it will be lifted to the No. 2 transfer car that runs north from the furnace to the desulfurizing area. An empty ladle will then be put on the blast furnace transfer car and the car moved back under the cast house. This procedure is then repeated as each ladle is filled. The hot metal from the furnace will be cast 12 times a day, and each cast will have two or three ladles. The blast furnace operator will attempt to fill all ladles to a specified weight of nominally 300 tonnes (330 tons) plus or minus 50 tonnes (55 tons). In any case, he will not send any ladles to steelmaking that are less than two-thirds full. The pollution control systems employed in the cast house are described later in this chapter.

h) Hot Metal Desulfurization

1.134
All hot metal for steelmaking will be desulfurized by injecting a mixture of calcium carbide (CaC) and calcium carbonate ($CaCO_3$) into the liquid metal. This will be accomplished in a section of the hot metal transfer aisle building. As the full ladle is received from the blast furnace on the No. 2 transfer car, the No. 2 electric overhead crane will pick up the ladle and set it down on the desulfurization transfer car. The DeS car will then move the ladle into the desulfurization station. Powdered CaC and $CaCO_3$ will be stored in overhead bins under controlled atmosphere for injection through a lance deeply immersed in the ladle. Compressed nitrogen coming from the air separation plant will be used as a carrier for the calcium compounds. The desulfurization product is a high sulphur slag that floats on top of the metal. The fumes created during this operation will be captured by dust collection hoods and exhausted through a baghouse. After desulfurization, the DeS car will move the ladle to the other side of the building where the slag will be skimmed off onto the ground or into containers and hauled away and treated as blast furnace slag. The No. 2 electric overhead crane will pick up the ladle and put it on the No. 3 transfer car or set it on the floor. At this point, the ladle of hot metal can go directly to the basic oxygen furnace or to the hot metal mixer. If it is to be dumped into the hot metal mixer, the No. 3 electric overhead crane will do this operation. The No. 4 electric overhead crane will be a standby crane in case any of the other cranes are out of service.

i) Slag Granulation

1.135
The blast furnace slag will be continuously granulated. The granulation process will be the Japanese RASA system or equivalent. Upon separation from the pig iron, the slag flows in a trough into a water blowing box where cooling and granulation occur. Slag and water flow by gravity into an agitating tank. The resulting slurry is pumped into one of several dewatering storage tanks. The dewatered slag is discharged through a gate at the bottom of the dewatering tanks and can be hauled away directly. The water is pumped into a reservoir, cooled in a cooling tower and recirculated to the water blowing box. No waste water effluent is generated during this process.

j) Pig Iron Granulation

1.136
There are times when the blast furnaces produce too much iron or off-grade iron unsuitable for steelmaking. To handle this problem, a pig iron granulation facility will be installed at the south end of the

hot metal charging aisle. Pig iron ladles will be carried there on the No. 1 transfer car. At the granulation station, a fixed tilting mechanism will pour the metal at a slow, controlled rate into the granulator. The granulated iron will then drop into a large quench tank and will be removed by a conveyor and stockpiled on the ground at the end of the tank. Several shallow pits will be provided on the ground near the granulator for emergency dumping of iron.

Oxygen Steelmaking

1.137
The steelmaking shop will consist of three Q-BOP furnace enclosures with 300-tonne (330-ton) vessels. Two furnaces will be installed in Phase I of the plant construction, with one of the furnaces being operated at all times and producing an average of 31 heats per day. The third furnace will be installed in Phase II, at which time two furnaces will be operated at all times, producing an average of 62 heats per day. One furnace will be down at all times for reline, bottom change, or other maintenance activity. The production capacity will therefore increase from 3,400,000 tonnes (3,750,000 tons) per year at the end of Phase I to 6,800,000 tonnes (7,500,000 tons) per year at the end of Phase II. A normal heat will consist of 85 percent to 87 percent hot metal, 10 percent to 13.5 percent revert scrap, and 1.5 percent to 3 percent coolant ore. Varying quantities of burnt lime and limestone will be used to make up the slag, but it is not anticipated that fluorspar will be added for fluxing the slag. The scrap consumption of the Q-BOP vessels will match the generation of scrap by the other facilities of the plant. Normally, no scrap will be purchased in the open market, nor will any home scrap be sold to other parties. Use of scrap in Q-BOP vessels does not have to be preheated.

1.138
The steel will be produced by blowing oxygen through the tuyeres in the bottom of the furnace vessel, with oil as the hydrocarbon coolant. A schematic of oxygen steelmaking process is shown in Figure 1-12. Nitrogen will be blown through the tuyeres during idling, sampling and charging. At the completion of the heat, the finished steel will be tapped through a tap hole from the furnace into a 300-tonne (330-ton) steel ladle, resting on a transfer car which will transport it through the ladle preparation aisle to the caster transfer aisle where it will be picked up to be carried to the continuous casting area. After the furnace is tapped, it will be tilted to the slagging position, and the slag will be poured over the furnace lip into a slag pot on a transfer car. This car will transport the slag pot to the slag dumping crane runway, where the crane will pick up the pot and dump the slag into a pit. The empty

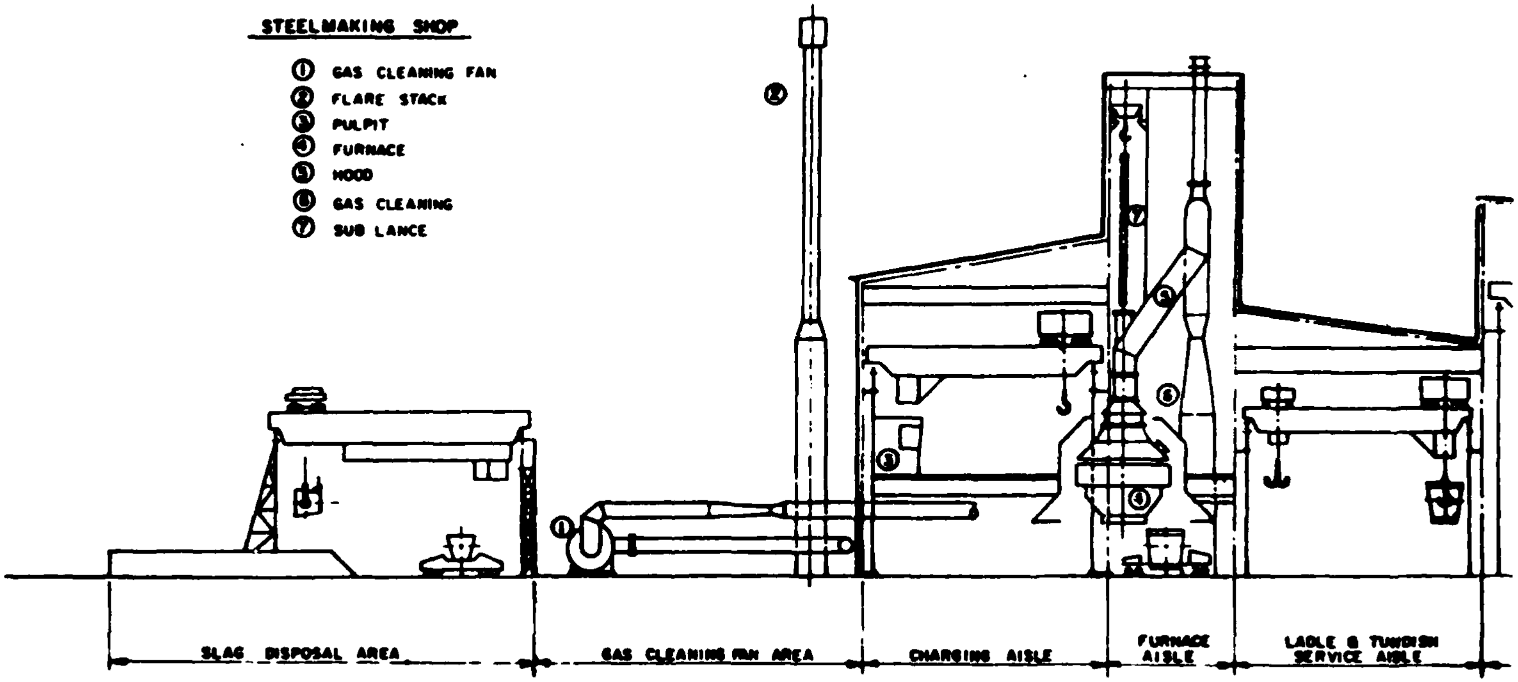

Figure 1-12 Q-BOP SCHEMATIC

pot will be sent back on the car to be ready for the next heat. Approximately 50 tonnes (55 tons) of slag will be generated during each heat.

1.139
The waste gas from the furnace will be collected and cooled in a membrane-type hood and directed to a venturi saturator and then through a Pease Anthony venturi scrubber. This will be a "suppressed combustion system" designed to restrict combustion with ambient air to 15 percent of the CO-rich off-gas. There will be an adjustable skirt at the bottom of the hood which will be lowered to restrict the entrance of combustion air. The waste gas volume will be approximately 3,500 Nm^3 (130,200 scf) per minute. The hood-cooling water will be cooled in air-to-water heat exchangers and pumped back through the system. The scrubber water for the gas cleaners will be pumped to a classifier and a thickener, where the dust from the process will be removed and the clean water will be recirculated. Approximately 7.5 kilograms (15 lbs) of dust will be produced for each tonne (ton) of steel produced. The solids from the thickener will be removed from the slurry by rotary drum-type filters, and the solids will be returned to the sintering plant for sintering. Table 1-15 summarizes the major input and output data pertaining to one heat.

a) Scrap Handling

1.140
The scrap produced at all facilities in the plant will amount to almost one million tonnes (1.1 million tons) per year. It will be delivered by truck from all of the producing points to a scrap yard where a dock will permit dumping directly into any one of the three scrap boxes or into a scrap bin in the yard. Two 25-tonne (27.5 ton) scrap loading cranes will be able to trim the boxes to the required weight, as indicated by scales on which the transfer cars will rest with the scrap in place.

b) Hot Metal Handling

1.141
All hot metal from the blast furnaces will have undergone external desulfurization. The latter operation is done as part of the blast furnace operations described in a previous section of this chapter. The steelmaking shop receives desulfurized hot metal. The hot metal will be picked up from the desulfurizing transfer car by the transfer aisle crane and will be carried to the slag skimming station in the transfer aisle where one of two slag skimming machines will skim the slag from the ladle into a slag pot. The fumes generated by the skimming operation will be collected and directed to a baghouse for

Table 1-15

Input and Output Data for Q-BOP Steelmaking per Heat

Input	Units	Average
Hot Metal	Tonnes (tons)	280.6 (309.3)
Scrap	Tonnes (tons)	44.7 (49.3)
Lime	Tonnes (tons)	20.7 (22.8)
Limestone	Tonnes (tons)	1.5 (1.65)
Ore Pellets	Tonnes (tons)	5.1 (5.6)
Fluorspar	Tonnes (tons)	none
Oxygen	Nm^3 (scf)	15,000 (558,300)
No. 2 Fuel Oil	kg (lb)	1,000 (2,200)
Nitrogen	Nm^3 (scf)	6,000 (223,300)
Output		
Steel	Tonnes (tons)	300 (330)
Slag	Tonnes (tons)	50 (55)
Off-Gases: Total	Nm^3 (scf)	38,800 (1,444,000)
Flared	Nm^3 (scf)	19,400 (722,000)
Recovered(1)	Nm^3 (scf)	19,400 (722,000)
Vented	Nm^3 (scf)	0
Dust:	kg/tonnes (lb/ton)	7.5 (15)

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(1) Calorific Value of the recovered BOP off-gas is about 2000 kcal/nm^3 (220 Btu/scf)

Source: United States Steel Corporation.

cleaning. Following skimming operation, standard practice will call for the aisle transfer crane to carry the ladle to one of the three 2,500-tonne (2,750-ton) hot metal mixers and to pour the hot metal into one mixer. In the Q-BOP charging aisle, there will be three pits, one at each mixer, where an empty ladle will be set by the hot metal charging crane. The hot metal will be poured out of the mixer into the ladle resting on the scale until the required amount is in the ladle. The hot metal charging crane will then pick up the ladle and carry it to the Q-BOP furnace, where it will be charged into the furnace, for a top-blown BOP vessel. If, however, the ladle is to go directly to the Q-BOP, it can be set on one of two hot metal transfer cars south of the three mixers to be transferred to the east into the parallel charging aisle. The north crane will then pick up the empty ladle and take it back to the desulfurization station and set the ladle on the floor to be handled by the blast furnace portion of the transfer aisle. The fumes generated during hot metal transfer to and from the mixers will be collected by hoods and exhausted to a baghouse. The emissions generated during furnace charging will be handled by the furnace emission primary control system and the secondary collection hood.

c) Furnaces and Drives

1.142
Each furnace will have a capacity of 300 tonnes (330 tons) per heat, a working volume of approximately 310 cubic meters (10,900 cu ft), a ratio of internal height to diameter of approximately 1.25 to 1, and a bath depth of 1.4 meters (4.6 ft). Each furnace will be driven by a shaft-mounted gear drive with four motors, of the lay-back design. The furnace will be completely enclosed. This enclosure will be equipped with hydraulically driven charging doors which will be opened to charge the furnace with scrap and hot metal, but at all other times will be closed to contain the fumes. After the furnace is charged with the scrap and hot metal, oxygen will be blown through tuyeres in the bottom of the furnace at an averge rate of 1,250 Nm^3 (44,000 scf) per minute, and a maximum of 1,500 Nm^3(55,000 scf) per minute for approximately 12 minutes to produce a heat of steel. An annular space around the oxygen pipe will be supplied with oil to cool the tuyeres during blowing.

d) Fluxes and Ladle Additions

1.143
The burnt lime and limestone will be injected through the tuyeres with the oxygen after being pulverized at the site of the burnt lime plant and transported pneumatically to the Q-BOP shop. The transport air will be cleaned as it leaves the operating bins at the Q-BOP shop

by passing through baghouses before it is exhausted to the atmosphere. The dust which is removed from the transport air will fall back into the operating bins as the bags are cleaned. In addition, there will be a set of overhead bins at each furnace consisting of four bins for ore, limestone, and other materials to be added through the furnace mouth during the blow. These will be brought by a conveyor system from unloading bins at the ground level up to the top floor of the furnace building, where they will be discharged by a traveling tripper into the appropriate storage bin. From these storage bins, the material will be discharged by vibrating conveyor to a weigh bin for batching prior to delivery to the furnace. A vibrating feeder will feed the material from the weigh bins through a chute in the hood into the furnace through a system of gas seals. In addition, at each furnace there will be chutes into which the tripper can discharge ferromanganese (both high and medium carbon) and ferrosilicon to be added to the ladle. These chutes will direct these materials into storage bins at a lower elevation, so that ladle additions can be made without disturbing the normal ladle handling procedure. At the unloading bins and at all conveyor transfer points, hoods will be provided with ducts leading to baghouses to collect the dust generated during unloading, transfer, and conveying of the material to storage bins. Hoods will also be provided at the outlets of the storage bins to collect the dust generated during discharging to the weighing bins and discharging from the weighing bins to the chutes leading to either the furnace or the ladle.

e) Process Gas and Oil System

1.144
The process gas and oil system consists of the oxygen and nitrogen gas systems and the fuel oil tuyere coolant system. Oxygen and nitrogen will be produced in an air separation plant on the plant site and will be piped to the Q-BOP site where gas storage will be provided for the peak requirements of both gases. The piping systems will direct the oxygen to the injection tanks of the flux system where burnt lime and limestone will be entrained into the oxygen gas stream, which will then go through a rotary joint mounted on the furnace shaft for distribution to the center pipes of the tuyeres in the furnace bottom. Prior to the rotary joint, the nitrogen piping system will be connected to the oxygen piping system. In this fashion, nitrogen can also be directed to the center pipe of the tuyeres for use during charging and tapping and also during idling periods of the furnace cycle. A fuel oil storage, piping, and pumping system will be provided to supply the tuyere annulus with fuel oil for use as a coolant when oxygen is being blown through the tuyeres. At other times, nitrogen can be directed through this oil system for use when the furnace is being charged, tapped, or slagged

or is in an idle mode. All necessary control valves and instrumentation will be provided to automatically direct the correct gas or fuel to the tuyeres at the proper time and to inject the flux material at the correct rate, as required.

f) Q-BOP Gas-Handling

1.145
The carbon dissolved in the hot metal is oxidized to carbon monoxide by the oxygen injected through the bottom of the furnace. This pure CO rises above the bath and will be collected and isolated from the atmosphere by a suppressed combustion system. The gas will then be cooled, cleaned, and sent to the boilers for use as a fuel.

1.146
The waste gas, as it issues from the furnace mouth, will be collected in a water-cooled membrane hood. The hood will be circular in cross-section, and will be made up of tubes welded together with flat bars to form a gas-tight collector. The hood has a fixed section and a movable section. A gas-tight connection is provided between the movable and fixed sections. This connection between the hood sections can be quickly disconnected to allow the moveable section to be removed for furnace maintenance. The movable hood section will be mounted on a hood car, so that it can be moved out of its operating position when relining or other maintenance tasks must be performed on the furnace. The hood will have an adjustable skirt which will be lowered and raised by a hydraulic system to restrict the annular space between the furnace mouth and the skirt to control the amount of air allowed to enter the hood, thus restricting the combustion of the carbon monoxide to a maximum of 15 percent. The adjustable skirt will be connected to the movable hood section with proper water seals. The gases pass through the upper section of the hood at a temperature of 1,260°C (2,300°F) and are cooled to approximately 1,010°C (1,850°F) in the hot gas cooler before entering the gas cooling plant. The gas-cooling section consists of a series of nested tubes supported in a mild steel, circular outer jacket. The gases leaving the radiant section of the hood pass into a venturi quencher where they are cooled to an outlet temperature of about 77°C (170°F). At the same time, some 85 percent of the dust entrained in the gases is removed. The cooled gases leaving the venturi quencher pass through an elbow separator into a variable-throat Pease Anthony venturi scrubber, where the finer dust particles are removed.

1.147
The adjustable throat acts both as a highly efficient dust-collecting unit and as a means of controlling the pressure in the waste gas

hood. This system maintains a constant hood pressure during the oxygen blow by opening and closing the movable trough inside the venturi. The dust particles remaining in the waste gases after leaving the quencher are removed in the venturi scrubber. Finally, the cleaned gases pass through a second elbow separator and through a mist eliminator before being piped away as a clean fuel, containing less than 36 mg/Nm^3 (0.015 gr/scf) of particulates. About 50 percent of the gas generated is recovered in this manner. Recovered gas will be used in a steam boiler that also accepts blast furnace gas and steam coal. A gas holder will be installed. Only 5 percent of the recovered gas might have to be flared for such reasons as momentary low demand for steam. Flaring will be carried out in a burner of the type built by the Bloom Engineering Company, Inc. or equivalent. The auxiliary fuel used in the flare will be coke oven gas used at an average rate of 0.39 Nm^3 (14.1 scf) per minute or a maximum rate of 0.78 Nm^3 (29.0 scf) per minute.

1.148
The scrubber water flow to both venturis is approximately 850 cubic meters (30,000 cu ft) per hour with the water first being pumped from a thickener overflow to the scrubber. From a separator at the bottom of the scrubber, it is pumped to the venturi saturator, and from there to the water treatment facilities where the suspended solids are removed in a cyclone, classifier, and thickener and the cleaned water recirculated to the scrubber. The dust consists mainly of iron oxides and goes to the sintering plant for recycling. It should be noted that the Q-BOP generates 7.5 kilograms per tonne (15 lbs/ton) of dust. This is considerably lower than the average 25 kilograms per tonne (50 lbs/ton) generated in a top-blown BOP (USEPA Publication AP-42 "Compilation of Air Pollution Emission Factors"). A secondary capture hood is provided for the furnace enclosure, independent of the main gas-cleaning system, to collect the fumes generated while charging the furnace with hot metal. The saturator venturi is closed (approximately 80 percent) when the furnace is being charged, so that approximately 80 percent of the main gas-cleaning fan capacity is available to collect and clean the charging fumes.

g) Steel Handling

1.149
Steel will be tapped from the furnace into a ladle equipped with a slide gate. The ladle will be held on a ladle transfer car and be moved into the caster ladle aisle, where the ladle will be picked up and set on the ladle rotator by the caster ladle crane. An argon stirring and trim station will be provided on each transfer track for trimming the heat as required by adding aluminum wire, cooling by dunking a slab or stirring with argon.

h) Slag Handling

1.150
The furnace will be rotated to the charging side after completion of steel tapping, and the slag will be poured into a slag pot on a transfer car. This car will move the pot beneath the slag crane where the pot will be picked up and dumped into one of the slag pits. The slag will be cooled by water spray, then will be dug and transported to the reclamation area where metallic will be removed. Of the 50 tonnes (55 tons) of slag thus generated per heat, about 30 percent will be recycled to the sinter plant.

Slag Processing

1.151
Iron and steelmaking operations form slags in the furnace during the smelting and refining processes. Slags are molten silicate complexes formed by a combination of refractory metal oxides or sulfides originating as gangue in the ore, ash in the coke, and fluxes added to the charge. All slags are molten when tapped from the furnace. The proposed facility will generate two types of slags, namely, blast furnace slag from ironmaking, and Q-BOP slag from steelmaking. Integrated steel plants generate slags which amount to about 40 percent to 60 percent of the steel ingot production. At the proposed plant, processing, recovery, and shipping of about 3.2 million tonnes (3.5 million tons) of slag will be an important part of the plant operations and material balance. A schematic of the flow of materials through a slag processing plant is presented in Figure 1-13.

a) Blast Furnace Slag

1.152
The proposed plant will generate annually about 2,100,000 dry tonnes (2,300,000 dry tons) of blast furnace slag. The approximate analysis of the blast furnace slag is CaO (40 percent), MgO (11 percent), SiO_2 (39 percent), Al_2O_3 (8 percent) and other (2 percent). This slag will be primarily water granulated and it is projected that essentially all of this slab will be handled in this manner, except for emergency conditions when air cooling will be employed. The treatment of the blast furnace slag by water granulation has been improved and the latest technology will be used in this plant. In this scheme, the molten blast furnace slag will be cooled rapidly by means of high-pressure water jets at the blast furnace site. Fast-cooling the molten slag in the jet of water prevents the slag from having the time to form crystals, and it solidifies as a glassy-type material. This material is known as granulated slag because it takes the form of small sand-sized granules. The water and slag slurry

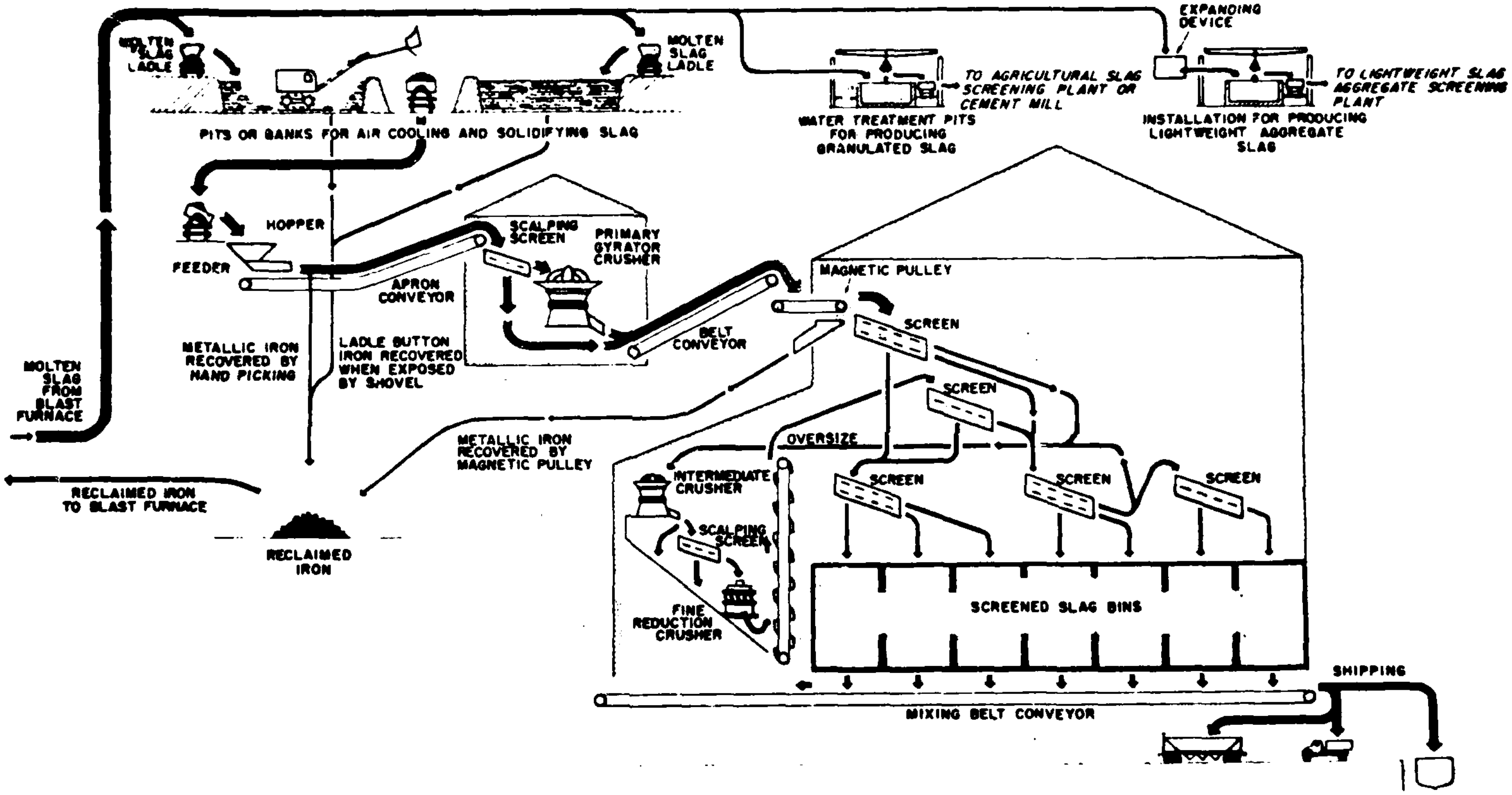

Figure 1-13 SLAG PROCESSING SCHEMATIC

will be pumped to nearby dewatering bins with each bin having a capacity of 125 cubic meters (4,400 cu ft). The water from the dewatering bins will be recycled for granulation and the moist slag will be transported on rubber belt conveyors to the processing plant for storage and shipment. Due to moisture in slag, any dust emissions from the conveyor or processing plant will be negligible.

1.153
The granulated blast furnace slag can be used in a number of applications such as cement making, aggregate for concrete blocks, and waste solidification. It will be shipped by truck, rail, or water to various manufacturers for use in their products. It can be added to Portland Cement to make a product called slag cement. During the granulation of blast furnace slag, large volumes of steam vapors are generated along with small quantities of H_2S. In order to reduce the emissions generated from the slag granulations, the steam is collected in a hood and stack and additional water is sprayed into the stack to condense the steam and remove the H_2S. The granulator stack will be 50 meters (164 ft) high. The emission level from this stack is expected to be less than 5 ppm H_2S (0.003 gr/dscf) and, therefore, will not require any H_2S removal equipment. There will be two granulators for each furnace. During emergency periods when a granulator requires repair, a proportionate share of the molten blast furnace slag will be sent to the air cooling pits. The applicant estimates that the slag granulation system at the blast furnaces will occupy an area of about 280 square meters (3,000 sq ft). Holding capacity will be provided for about 300 tonnes (330 tons) of granulated slag. Combined, the granulated slag storage, processing, and shipment facility will cover about 30 acres. U.S. Steel expects that essentially all of the blast furnace slag or about 2,100,000 dry tonnes (2,300,000 dry tons) will be granulated and sold annually.

1.154
When slag is allowed to cool in air and solidify, either in a ladle or a pit, it develops a crystalline structure similar to that of a natural igneous rock. Sizes of individual crystals range up to as large as 3 millimeters (0.12 in.). This air-cooled slag is used as roadstone, as concrete aggregate, as filter media, and as railway ballast. The only air-cooled blast furnace slag to be produced in the proposed plant will arise from emergency conditions, so the quantity cannot be projected at this time. In order to air cool the blast furnace slag, two pairs of cooling pits would be provided for each furnace, each pair having seven days holding capacity. One pit will be used to receive the molten slag so that the slag in the other pits can be cooled and excavated. Each pit will be about 3.6 meters (12 ft) deep, 18.3 meters (60 ft) wide, and 61 meters (200 ft) long. The molten slag from the blast furnace will flow directly into the pits through runners in the cast house floor. Hot slag is charged

into a pit until it is full. It will solidify and be allowed to cool and, if necessary, water sprays will be used to increase cooling efficiency. Care will be taken that no more water is added than necessary to cool the slag. The cooled slag will be excavated by front-end loaders and trucked to the on-site processing plant for recovery of iron values and crushing, screening, and sizing of the slag. It is likely that the cooled slag will contain some small buttons of metallic iron. The excavated slag will be scalped on an 18-inch scalping screen. Oversize material (greater than 18 inches in diameter) which comprises about 2 percent of the total output will be transported to the iron processing area. The remaining pieces less than 18 inches in diameter consist primarily of slag. This material is conveyed to a gyratory crusher designed to handle 100 tonnes (110 tons) of slag per hour where the overall size of slag pieces is reduced to about 8 inches. Further crushing and screening will be performed as required to fulfill the various specification requirements of slag customers. For some slag screening and metallic separation may be required.

b) Steelmaking Slag

1.155
The manufacturing of steel involves the reaction of molten iron with oxygen to remove excess quantities of carbon, silicon, and phosphorus by oxidation, and the addition of small quantities of other constituents that are necessary for imparting special properties to the steel. The surface of the molten metal with its dissolved additions is covered with a slag layer for metallurgical requirements and to protect the molten metal from oxidation with ambient atmosphere. The slag layer is generally formed by the additions of burnt lime. Steel slag has about 10 percent iron content in the metallic and oxidized form and thus has possibilities for recovery by charging the slag to the blast furnace. The major incentive for recycling steel slag to the blast furnace is that less coke is consumed primarily because the calcium and magnesium oxides are already in a calcined state. Consequently, less heat is required to provide the calcium and magnesium oxides for slagging. In addition, recycling the slag reduces the solid waste disposal problem to some degree.

1.156
The hot slag from the Q-BOP furnaces will be tapped into 70-tonne (77-ton) ladles and transported to the slag cooling pits located about 130 meters (430 ft) from the Q-BOP furnaces. The Q-BOP slag will be cooled in three pits, each occupying an area of about 780 square meters (7,500 sq ft). Hot slag from the steelmaking furnaces will be dumped into the pits on a systematic schedule so that while one pit is being filled with molten slag another pit is being cooled and excavated. Each pit is expected to have a capacity to hold about

three days of Q-BOP slag. When cooled, the slag in the pits will be dug out by front-end loaders, loaded into dump trucks or railroad cars, and transported to the slag processing plant which will be located on-site.

1.157
The slag processing plant will crush, screen, and size the slag and remove the metallics by electromagnetic separation. It is estimated that about 260,000 tonnes (290,000 tons) of metallics will be generated per year. All metallics will be returned to the blast furnace stockhouse and the steel shop scrap yard for charging to the blast furnace and Q-BOP. It is estimated that about 50 percent of the metallics will be charged to the blast furnace and the remainder to the Q-BOP. The plant will also produce about 870,000 tonnes (960,000 tons) of processed slag. Of the 870,000 tonnes (960,000 tons) of the metallic-free Q-BOP slag produced annually, about 290,000 tonnes (320,000 tons) will be returned to the blast furnace stockhouse for charging to the blast furnace. The balance of the processed Q-BOP slag will be either sold, if a market is available, or recycled through the sinter plant or the iron or steelmaking furnaces.

1.158
Compared to the characteristics of blast furnace slag, steel slag has less advantage. It is dimensionally unstable compared with blast furnace slag, due to the higher quantity of free magnesia and lime. During exposure to the atmosphere, both oxides react with moisture and form hydrates causing undesirable expansion and disintegration of the steel slag particles. The dimensional changes can be stabilized by aging the slag in storage. The chemical composition of steel slag can vary considerably over time at a given steel plant as the grades of steel change. Despite these limitations, steel slag has potential applications in unconfined modes such as railroad ballast, road shoulders, or banking. Since Q-BOP slag is a relatively new commodity in the marketplace its potential markets are not well defined. U.S. Steel is engaged in efforts to establish potential markets and recyclability to the blast furnace of the Q-BOP slag. Such markets could include railroad ballast, soil conditioner, or skid-resistant aggregate.

c) Slag Processing Plant

1.159
The slags from the blast furnace ironmaking and the Q-BOP steelmaking will be sent to the on-site plant to process and segregate the slags into recycled materials and salable products. The slag processing plant will have separate areas for stocking the granulated and air-cooled blast furnace slags and the Q-BOP slag. As appropriate, the

respective slags will be crushed and magnetically separated into metallic and non-metallic fractions. The metallic fractions will be trucked back to the Q-BOP scrap yard or the blast furnace stockhouse. The non-metallic fractions will be further crushed, if required, screened, sized, and segregated according to type of slag and intended end use. The slag fractions to be recycled will be returned to either the blast furnace stockhouses, the Q-BOP flux charging bins, or the sinter plant feed blending area. The slags for sale will be put into storage pending shipment either by rail or truck. The processing plant will provide for live storage of up to 180 days and truck loading stations and rail sidings with capacity for up to 100 cars.

1.160
The conventional slag processing operations are accompanied by dust emissions. Blast furnace slag granulating facilities will be enclosed as required by the USEPA. Dry slag pits will be used in case of emergency when granulation is not possible. The slag plant will be equipped with suitable air pollution control systems to contain and capture the airborne particulates and prevent their exhaust to the ambient atmosphere. The Q-BOP slag processing plant with its stockpiles and product storage will occupy an area of 135 meters (440 ft) by 520 meters (1,700 ft) or about 70,000 square meters (17 acres) of the 30 acres of the slag processing area. The slag crushing and screening operation will be enclosed and the gas streams will be exhausted through a baghouse.

Continuous Casting Plant

1.161
Continous casting of steel slabs involves the pouring of molten steel via a tundish into an open-ended, water-cooled mold, which forms the slab cross-section in a continuous strand casting. The cast strand is withdrawn from the mold, turned, straightened, and cut into lengths required for individual slabs. A schematic of three types of continuous caster arrangements for differing product types is shown in Figure 1-14. The continuous casting plant will be designed to process 6.8 million tonnes (7.5 million tons) of molten steel, at a 93.3 percent yield, to produce slabs for production of sheet, strip, and plate. The proposed plant will have six dual-strand slab casters, each capable of producing 1.3 million tonnes (1.430 million tons) of slabs annually. A similar installation exists at U.S. Steel's Texas Works for the production of plate slabs. Slab sizes to be cast for the plate mill will be 185, 200, and 250 millimeters (7.3, 7.9, and 9.8 in.) thick by 1,930 millimeters (76 in.) wide. Slab sizes for the hot strip mill will be 200 and 250 millimeters (7.9 and 9.8 in.) thick by 900 to 1,600 millimeters (35.4 to 63 in.) wide. All six dual-strand machines will be capable of casting plate

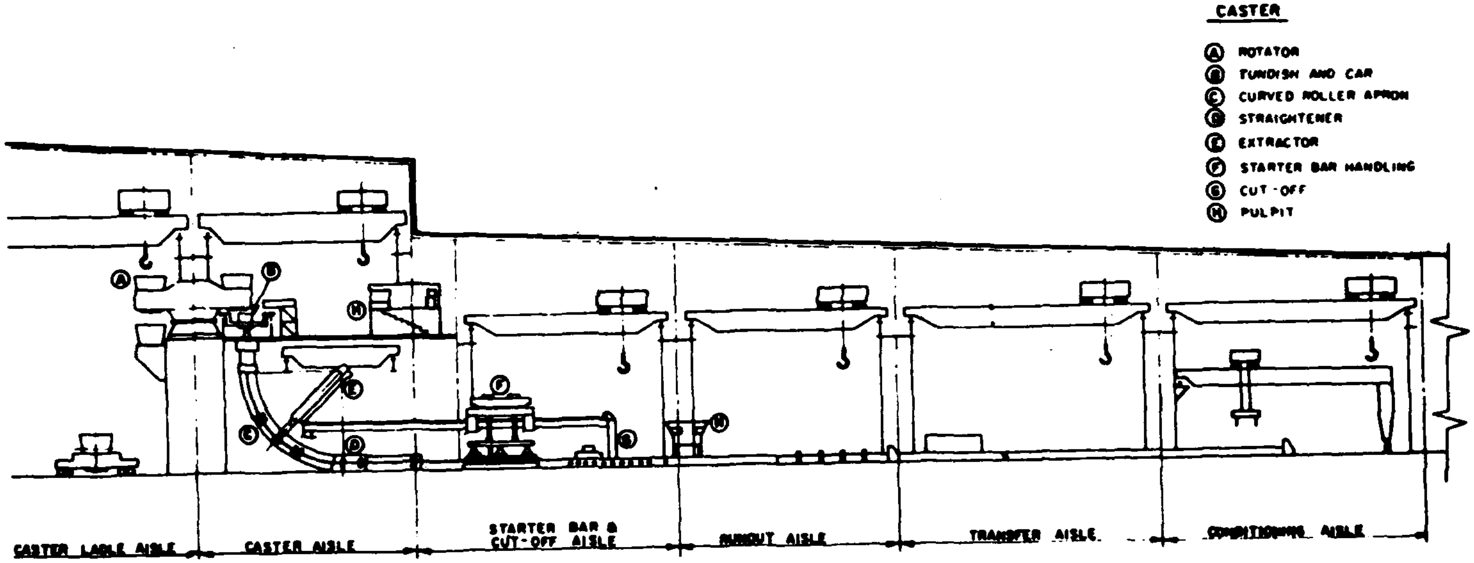

Figure 1-14 CONTINUOUS CASTING SCHEMATIC

and strip slabs. Twenty-five percent of the annual capacity of the continuous casting plant will be processed through the plate mill. The balance will be processed through the hot strip mill.

a) Facilities and Operations

1.162
The casting facilities are arranged in a parallel aisle system to deliver the cast product to a plate mill and a hot strip mill with a minimum of crane handling. The layout of the buildings, cranes and auxiliary services is such that proper scheduling of the melt shop, caster operations, maintenance and product grouping allows the projected high throughput rates to be attained.

1.163
At the completion of a steel heat in the Q-BOP furnace, the heat is tapped into a teeming ladle. The Q-BOP furnace heat will then be moved from the furnace aisle to the ladle aisle by a furnace ladle transfer car. The furnace ladle transfer car will stop at the argon stirring and trim station for treatment which will require a maximum of five minutes. Argon stirring of the molten steel in the ladle is advantageous to homogenize the temperature and composition of certain heats. It also assists the flotation of non-metallics and removes dissolved gases such as nitrogen, oxygen and hydrogen. The off-gases are small in quantity and also contain trace amounts of carbon monoxide. Particulate emissions have been calculated to be of the order of 100 milligrams per tonne (0.0002 lb. per ton), based on vapor pressure of iron entrained in the argon bubbles.

1.164
The casting aisle building will be a lower and relatively lighter structure than the ladle aisle building. The ladle will then be lifted onto a caster rotator by the ladle crane after removal from the transfer car. The caster ladle rotator will be designed as a single arm with capability for continuous rotation through 360°, so it will be able to transport the full ladle of steel from the crane setting, by 180° rotation, into position over the tundish. For sequence casting, a second full ladle would be positioned into the empty support arm before the first ladle is wholly emptied. When the first ladle is emptied, the rotator is turned through rotated 180°, putting the empty ladle in position under the ladle crane, while at the same time positioning the full ladle of steel over the tundish. Since the tundish has a capacity of about 30 tonnes (33 tons) of steel, casting will continue without interruption while a ladle change is made. The procedure from the end of tapping to the beginning of pouring into the tundish involves moving the furnace transfer car from Q-BOP furnace to the trim station (1.5 min.); initiating the argon stir and adding alloys (4.5 min. (average));

move the transfer car from trim station to ladle aisle (0.5 min.); engage the ladle crane 'J' hooks and raise and position ladle of steel on the ladle rotator (7.5 min.); rotate the ladle, then remove nozzle plug and engage the autopour (2.0 min.), completing the operation. The total time required for this activity is 16 minutes.

1.165
The molten steel is cast by first pouring from the ladle into the tundish and then from the tundish into the molds. Shrouding by tubes or inert gas will be provided for shielding the ladle-to-tundish and tundish-to-mold pouring streams against oxidation by ambient air. Insulation flux or powder will cover the liquid surfaces in the tundish and the molds. The casting floor will have an elevation of about 15 meters (49 ft) and will be spanned by three 60/15 tonnes (66/16.5 tons) of cab-operated electric overhead traveling cranes. The cranes will make tundish changes, move the tundishes for reline, make mold and discharge rack changes, and participate in caster line maintenance. Major tundish refractory relines will be made in the ladle preparation aisle. Minor tundish repairs and preheating will be performed on the casting flood, next to each casting machine.

1.166
The tundish preheat stations, located on the casting floor, are required to preheat the tundish refractory to a temperature of 1,200°C (to prevent a thermal shock at the contact of liquid steel). COG will be used as a fuel to preheat the tundishes. Controls for the tundish cover burners will be located on both sides of each of the six casting machines. The burner heating capacity will be two million kcal (8 million Btu) per hour for each tundish. The emissions from tundish preheating are not controlled. Burned and unburned gases will rise, dilute, and exit through roof monitors. Each two-strand caster will have an air-conditioned control room with suitable instrumentation to monitor and control the operation. The control room will be positioned on the casting floor with an unobstructed view of the casting operation. It will be equipped with an intercon system with contact capability to all areas of the casting operation and downstream activities including the slab torch cutting stations. Each caster will be provided with a ladle rotator, a slag box, and an emergency ladle. Two tundish cars per casting machine will be provided to make the required tundish changes because of the large number of batch or single heats that will be cast. The tundish car track will straddle the mold and will extend the full length of the casting floor. A single tundish will be fed from the teeming ladle with a single nozzle and slide gate and service both strands of the casting machine. The tundishes will be provided with slide gates for submerged nozzle casting. A system will be provided to raise and lower the tundish while on the car, so that the submerged shroud tube could be changed. Provision for tundish dumping

will also be available on the tundish car. Tundish dumping and cleaning stations will be provided on each side of a casting machine. The station will be provided with fume collecting hoods and duct systems to exhaust through a bag-house to control emissions when residual steel and slag dumped from tundish and from the oxygen lancing of tundishes.

1.167
The molds will be of the four-piece design and will have liquid level controls. Each casting machine strand will have a straight vertical mold. After leaving the mold, the cast slab will descend vertically through a supporting guide rack for about 3.5 meters (11.5 ft.) at which point it would be turned to the horizontal on a 10-meter (32.8 ft.) radius. At this point, the core is still liquid at the bending point. Vertical guide racks will be fitted with edge roll supports of sufficient length to prevent edge bulging. After leaving the curved guide rack, the cast section will be straightened. At design casting speeds of 0.75 to 2.0 meters (30 to 80 in.) per minute, the cast section will be discharged from the slab leveller with the core still liquid. Horizontal guide racks will be provided to support the cast slab during final solidification. However, certain plate slabs will be of such composition that they will be completely solidified before reaching the lower tangent of the straightener.

1.168
The slab surface temperature in the vertical, curved and horizontal guide racks will be controlled to a predetermined level by means of a computerized water spray control system. The system will terminate at set points, which will be operated manually or controlled by a computer. A single computer will be used to control the secondary spray systems of all six casting machines in addition to logging data and scheduling heats. The contact spray water will be collected and passed through a scale pit where the scale will be removed for recycle. All the cooling water from the continuous casters will be sent for cooling treatment and recycle.

1.169
A short length of table roller will connect the horizontal guide rack with the torch cutoff or slab-parting machine. Each cutoff machine will have two torches of the "GEGA" fumeless burner type or equivalent. The casting machines will have primary torch cutoff machines to cut the slabs in lengths varying from 3.6 meters (11.8 ft.) to 12 meters (39.4 ft.). These primary cutoff machines will process an average of 30 slabs per hour, equivalent to 725 tonnes per hour (800 tons) per hour. The maximum capacity is 36 slabs per hour, which is equivalent to 900 tonnes (990 tons) per hour. Secondary torch cutoff machines will be available to cut slabs into 1.0 meter (39.4 in.) lengths for the plate mill use only. Slab lengths less than 1.8

meters (5.9 ft.) amount to 10 percent of the plate mill order book. Secondary torch cutting of plate slab production will occur only 18 percent of the annual operating time.

1.170
The three two-strand machines located at the northerly end of the casting aisle will primarily produce slabs for subsequent cold finishing at other locations to drawing quality sheet and tinplate applications. These machines will deliver the parted slab onto roller and transfer tables that will then feed the slabs directly into the hot sheet mill reheat furnace or through two two-sided scarfers with a slab turnover. This design also allows transport of slabs without crane handling. The proposed machine scarfing capacity will be 900 tonnes per hour (990 tons) per hour which is equivalent to thirty-six 23-tonne (25.4-ton) slabs per hour. About 15 percent of the cast slabs are expected to be machine scarfed. When necessary, spot scarfing will be performed south of the scarfer machine, in one of two mechanized scarfing machines. These are located over a transfer bed with a slab turnover mechanism. Each machine will spot scarf one broad face and one narrow face as the slab is processed across the transfer bed. This system can handle 300 tonnes (330 tons) per hour. Thirty-five percent of the annual slab capacity will require only 10 percent surface removal. No manual scarfing will be performed in the proposed plant. The particulate emissions from scarfing will be controlled by wet electrostatic precipitators with 98 percent collection efficiency.

1.171
The three casting machines located at the southern end of the casting aisle will produce slabs for rolling to plate as well as for rolling to strip and sheet products. The slabs from these machines can be put through the scarfing layout described above by crane transportation. The end of this slab line will be similar to that of the northern machines, using a piler and delivering the stacked slabs by crane. The slabs are delivered to the plate mill slab conditioning and sizing prior to being charged to the reheat furnaces.

1.172
Cooling water for molds, secondary cooling sprays, and machinery will be supplied by recirculating systems. Primary or mold cooling will be achieved by a closed loop system incorporating evaporative cooling heat exchanger, and the maximum water temperature rise will be 10°C (18°F). Secondary or product cooling sprays will be achieved by an open recirculating system and will satisfy machinery cooling requirements. Scale pits, sand filters, and cooling towers will be used for this system.

1.173
Ten percent or 750 kilograms (1,650 lbs.) per minute per strand of the product cooling water spray will be converted to steam. The exhaust fan capacity for each strand (totally enclosed) is 2,600 Nm^3 (97,000 scf) per minute or 5,200 Nm^3 (194,000 scf) per minute per machine. A single 2.5-meter (8.2-ft.) diameter stack will be provided for each machine and result in about 18 meters (60 ft.) per second stack velocity. Hydraulic systems will be designed as a series of locally oriented facilities. Phosphate ester-type fluids will be used at the casting floor elevation or above and an invert emulsion fluid will be used for the remaining applications. The grease system will be a high pressure centralized system utilizing a bulk handling tank and the required number of auxiliary pumping stations. American Oil "Rikon" grease or equivalent will be used. Scheduled maintenance will require 16 hours per week per machine. Major repairs and adjustments will occur at three separate intervals of four days per year per machine. Table 1-16 provides data on the slab casting machine. Data on specific consumable material requirements for liquid steel are presented in Table 1-17.

Hot Strip Rolling Mill and Finishing

1.174
The principal product planned for the proposed steel plant is the production and finishing of hot rolled strip and sheet from the continuous cast steel slabs. Among four major groups (bars, plates, hotrolled strips, and hot-rolled sheet) the classification of hot rolled carbon steel strip and sheet generally encompasses wide flat rolled stock having very high width to thickness ratios. This product is usually rolled as continous strip with lengths extending to 900 meters (3,000 ft.) or longer for thinner section material. By definition, sheet product dimensions are: 1.14 to 5.84 millimeters (0.045 to 0.23 in.) thick and 305 to over 1,220 millimeters (12 to over 48 in.) wide. Also the thickness of the strip product must be within the following range: 0.65 to 5.84 millimeters (0.025 to 0.23 in.). However, modern hot strip mills are capable of rolling and coiling material up to 25.4 millimeters (one in.) thick and 2,000 millimeters (80 in.) wide. In the finishing operations, the as-rolled strip dimensions are trimmed and cut to proper widths and lengths of strip and sheet for shipment. The hot strip mill has a capacity of 4.5 million tonnes (5.0 million tons) of hot bands.

a) Hot Strip Rolling Schedules

1.175
Rolling in a hot strip mill begins with the slab exiting from the slab heating furnace, with the drop out temperature at about 1,230°C (2,250°F). The transfer bar temperature at the exit of the last

Table 1-16

Slab Casting Machine Data

1. Q-BOP Furnace Heat Size - 300 tonnes (330 tons)
2. Number of Two-Strand Casters - 6
3. Maximum Casting Speed

Hot Rolled Strip	-	2.0 m (6.6 ft) min
Plates	-	1.5 m (4.9 ft) min

4. Average Casting Time per Heat - 45 mins
5. Casting Machine Slab Dimensions - 185 mm thick x 1930 mm wide (7.3 in. thick x 76 in. wide)
200 mm thick x 900 to 1930 mm wide (7.9 in. thick x 35.4 to 76 in. wide)
250 mm thick x 900 to 1930 mm wide (9.8 in. thick x 35.4 to 76 in. wide)
6. Slab Surface Temperature, *Secondary Cooling Zone* - 870 to 1000°C (1598 to 1832°F)
7. Cast Slab Solidification Time - 12.0 min for 185-mm (7.3-in.) thick slabs
14.6 min for 200-mm (7.9-in.) thick slabs
22.5 min for 250-mm (9.8-in.) thick slabs
8. Metallurgical Length - 29.2 m (95.8 ft) for 200-mm (7.9-in.) thick slabs
39.4 m (129.3 ft) for 250-mm (9.8-in.) thick slabs

Mold	1.00 m	(3.28 ft)
Vertical Guide Rack	3.50 m	(11.48 ft)
Curved Rack	15.71 m	(51.54 ft)
Leveller	3.37 m	(11.06 ft)
Horizontal Guide Rack	16.42 m	(53.87 ft)
TOTAL	40.00 m	(131.23 ft)
9. *Radius of Curved Rack*	10.00 m	(32.81 ft)

Source: United States Steel Corporation.

Table 1-17

Consumable Material Requirements of Liquid Steel

Item	Specific Consumption/tonne (ton)
Electric Power	35 kWh (38 kWh)
Service Make-Up Water	0.8 m^3 (28.3 ft^3)
Refractories	1.5 kg (3.3 lb)
Casting Flux	1.0 kg (2.2 lb)
Coke Oven Gas	30 Nm^3 (1117 scf)
Oxygen	2.0 Nm^3 (74.4 scf)
Argon	0.27 Nm^3 (10.0 scf)
Grease	0.05 kg (0.1 lb)
Lubrication Oil	8.3×10^{-6} m^3 (2.93×10^{-4} ft^3)
Hydraulic Fluid	1.7×10^{-4} m^3 (6×10^{-3} ft^3)

Source: United States Steel Corporation.

rolling pass would be about 1,120°C (2,050°F) and the strip temperature leaving the last finishing stand would cool to be about 870°C (1,600°F). The hotrolled strip is normally coiled at temperatures ranging between 565°C and 650°C (1,050°F). The reduction of slab thickness in the roughing section will vary on each pass, ranging from 15 percent to 50 percent but not exceeding 51 millimeters (2 in.). The width of the slab will also be reduced in the roughing section with the use of vertical edgers and this reduction can be as much as 102 millimeters (four in.). The reduction of strip thickness in each finishing stand varies depending on the bar thickness entering the finishing stands and the final gauge. However, the individual stand reductions could be as low as 10 percent in the last finishing stand and as high as 50 percent to 60 percent in the first finishing stand. The speed of the strip leaving the last finishing stand is the function of gauge, width, and temperature. This speed ranges from 245 meters (800 ft.) per minute to 1,525 meters (5,000 ft.) per minute. The tonnage capacities of a hot strip mill vary due to slab size, product mix, heating rate, speed, etc. In recent years, mills have been designed and installed with theoretical capacities of six million tonnes (6.6 million tons) per year. It is anticipated that a portion of the slabs cast will still be hot when charged to the reheat furnaces, so that the slab storage areas are minimized. Also whatever surface conditioning is required will be done with a hot scarfing machine and only minimal amount by hand-scarfing. The hot-rolled finishing department will be equipped with a temper mill for temper rolling or skin passing coils, slitters for dividing wide coils into coils of narrower widths, combination shear lines, a recoiling line, and a heavy gauge shear line. The combination shear lines are designed to perform multiple functions by combining several operations in series, such as uncoiling, flattening, temper rolling, slide trimming, recoiling, and cutting to length.

b) Slab Handling and Preparation

1.176

The slabs will either be charged to the furnaces on a roller table directly from the slab casters or from the slab yard. The slabs approaching the furnace area will be weighed and any loss scale will be washed off by a water spray. They will proceed down the roller table and be positioned in front of the proper furnace for charging. A pusher at this point will push the slab to a position where the walking beam mechanism of the furnace can receive it. The loose scale slurry will be sent up to the scale pit. The two slab yard buildings will be parallel to the continuous caster cooling and scarfing aisle and perpendicular to the hot strip mill building. These buildings will run north and south, and each building will be 336 meters (1,102 ft.) long by 32 meters (105 ft.) wide. The

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buildings will be serviced by electric overhead cranes, and both will have a half-bay electric overhead crane (low level). The furnace charging building will be 208 meters (680 ft.) long by 40 meters (130 ft.) wide and will house the entry ends of the furnaces, slab pushers, scale washoff facilities, and a weigh scale. The slab charging table will also run from the slab yard through this building to the furnace charging mechanism. This building will be serviced by one electric overhead crane to remove slabs from charging table in case of wrong sequence and for maintenance.

c) Slab Reheating

1.177
The slab reheating furnace building will be 132 meters (433 ft.) long by 21 meters (70 ft.) wide and will be serviced by one electric overhead crane for maintenance purposes. The slabs are heated in walking beam furnaces with multi-firing zone design to attain the proper rolling temperature. The construction and insulation of the side walls, roof and water-cooled members will be such that, with maximum length slabs and proper gap between the slabs, the fuel consumption will be minimized. The furnaces will be equipped with recuperators for preheating the combustion air. The primary fuel will be cleaned COG, or possibly mixed gas depending upon the fuel balance, and fuel oil will be used for balancing the fuel demand. The fuel combustion products will be exhausted through 50-meter (164-ft.) stacks. Double pushers will be installed for each furnace, so that a single row of long slabs or a double row of short slabs can be charged into the furnace. The slabs will be discharged into the mill building, and extractors will be used to remove the slabs from the furnaces and place them on the furnace discharge table. The slab return system will be an extension of the furnace discharge table back into the slab yard. The returned slabs will then be removed from the table by a slab yard crane and placed back into storage.

d) Slab Roughing

1.178
The heated slabs will travel on roller tables to the strip rolling mill, first through the roughing train and then the tandem finishing train. The main mill building will be 582 meters (1,900 ft.) long by 32 meters (105 ft.) wide and parallel the furnace building. The main motor room will be an extension of the furnace building eastward and will be 352 meters (1,155 ft.) long by 21 meters (70 ft.) wide. The mill building will be serviced by electric overhead cranes and the motor room by one electric overhead crane as well as one transfer car.

1.179
The roughing train will consist of a vertical edging scale-breaker, two four-high tandem reversing mills, a crop shear, and a finishing scalebreaker. The slabs will pass through the vertical edging mill where the proper width for rolling will be established. Also, the surface scale will be loosened on this pass to allow easier scale removal by the hydraulic descaling station which follows the vertical mill stand. The edger drive will be overdriven by a synchronous motor through gearing and spindles. A hydraulic descaling station after this mill stand will remove the loose scale which will be collected for recycle. After descaling, the slab (or shear bar) will continue traveling on a roller table to the first four-high reversing roughing mill with an attached edger on the entry side and descaling headers (top and bottom) on both sides of the mill. The slab will enter the second four-high reversing mill and descaling headers (top and bottom) on both sides. There will be a total of six roughing passes taken through these tandem reversing roughers, three through each mill and the mills will be direct drive by DC motors. There will be a descaling station on both sides of these mills for reversing operations. These mills will be equipped with a quick roll changing device for the work rolls. However. backup rolls will be changed by the conventional sled method.

1.180
The slab will then travel on a roller table called the holding table, which is equipped with a cobble push or pulloff device. The cobbles will be cut at a torch burning station after removal from the holding table and loaded into scrap boxes for transporting to the steelmaking scrap yard by mobile equipment. The holding table will be designed to accomodate a width gauge, a temperature gauge, and a thickness gauge.

1.181
As the slab proceeds down the holding table, the head end will be cut off with a crop shear of rotary drum design. The same shear will also be used to cut off the tail end of the slab. The cutting of the front and back crops will be done automatically and the shear will be designed to allow quick drum change. The crop disposal will be accomplished through an inclined chute which extends down into the crop box. The sheared crops will be recycled back to the steelmaking furnaces without intermediate treatment. After the slab leaves the crop shear, it enters the finishing water descaling station prior to the finishing rolling section of the mill. The finishing scale breaker will be designed with two pairs (top and bottom) of descaling headers. There will also be two pairs of damming rolls, one pair ahead of and one pair after the descaling headers. The scale removed from the slab (or sheet bar) as it is processed through the roughing section falls between the table rollers into a flume underneath and is flushed to a primary scale pit.

1.182
The water used for direct cooling in the roughing section as well as the furnace charge and discharge tables will flow to a primary scale pit before discharge to the treatment plant and recycling.

e) Strip Finish Rolling

1.183
After the rough strip passes through the finishing descaling station it will enter the finishing stands. The strip will be reduced to the final gauge as it passes through these stands and the gauge will range from 1.7 to 12.7 millimeters (0.070 to 0.50 in.) or heavier for this particular mill. This mill will have interstand cooling, as well as rolling cooling. The fine scale and water will fall into a flume underneath and flow to a primary scale pit. The water used for direct cooling of rolls and product will also flow to the primary scale pit before discharge to the treatment plant and recycling. The finishing train will consist of seven four-high mills. These mills will be direct drives or through gearing, but whenever practical direct drive systems will be used. These mills will be driven by DC motors.

1.184
The necessary drive power will be available for accelerating the strip or "zoom rolling." Conventional roll cooling systems will be provided, and the use of rolling oil will be incorporated in the design for the first five stands. Interstand cooling will be provided between all finishing stands. Loopers will be furnished between all finishing stands along with the most modern automatic gauge control system and an oxide control system, either wet or dry, will also be provided. Mills will be equipped with quick roll changing devices for the work rolls, while backup rolls will be changed by the conventional sled method. On the discharge side of the last finishing stand the runout table will be designed to accomodate width, thickness, and temperature. The strip will exit onto the runout table (roller table) and be cooled to the proper temperature before coiling so that the required metallurgical and mechanical properties are met. The runout table will also incorporate laminar jet cooling on both top and bottom headers. The runout table will be designed to accommodate a temperature gauge just prior to the coiler side guides. Direct cooling water used on the runout table will fall between the table rolls into a flume underneath and will flow to a primary settling basin before discharging to the treatment plant and recycling.

1.185
As the strip travels down the runout table, it will terminate in one of the three downcoilers for coiling. As a coil is completed, it is

stripped from the coiler mandrel with a coil car and moved onto a transfer system. Included in the transfer system will be a scale, banding machines, and automatic marking machines. Coils will be carried on a transfer system for delivery to either the finishing facilities raw coil storage or to an outside storage area. The final direct cooling water is used on the coilers and will discharge to the same settling pit as the runout table water. The water system for this mill will be a closed loop system, and the necessary scale pits, oil skimming, filtration facilities, etc., will be provided.

1.186
A computer will be installed to completely automate the rolling mill, from the furnaces to the coilers. A total process operation control computer will also be provided for inventory control of slabs and hot rolled coils by grade or specification, dimensions and location, tracking and production recording, facility backlogging and master and detail scheduling of the rolling facilities and other support information required by Operations, Production Planning, and Metallurgy. Associated with this facility will be a roll shop and maintenance equipment shop which will be located adjacent to the mill building with an open court eight meters (25 ft.) wide between buildings for ventilation purposes. The roll shop building will be 272 meters (892 ft.) long by 40 meters (130 ft.) wide. The roll shop will include work roll grinders, backup roll grinders, lathe, degreaser, chock tilter, roll racks, electric overhead cranes, gantry cranes, and roll transfer car.

f) Finishing Hot Rolled Strip

1.187
The assumed product plan for the integrated steel plant as proposed by the applicant will require further processing of a portion of the product rolled on the hot strip mill. Facilities required to process this material will include two combination shear lines, a slitting line, a recoil line, a heavy gauge shear line, a temper mill, and an outside yard for direct shipments. These facilities will be located at the east end of the hot strip mill, and also to the south. The recoil line, slitting line, and temper mill will be housed in one building while a combination shear line and the heavy gauge shear line will be contained in a separate second building. The remaining combination shear line will be in a third building. The operations of the hot rolled strip finishing department will not generate emissions or effluents. The recoil line, slitting line, and temper mill will be housed in a building 672 meters (2,205 ft.) long by 40 meters (130 ft.) wide. Coils will be transferred to this building directly from the hot strip mill. Overhead cranes equipped with coil lifters will place the coils in a cooling storage area and after the coils have been cooled, overhead cranes with coil lifters will move the coils to an in-process storage area ahead of the operating units.

1.188
Temper rolling or skin passing is a cold rolling operation which results in a relatively light reduction in thickness of the rolled material. Temper rolling may be employed at the proposed plant to improve flatness, produce a desired surface finish, alter mechanical properties, or to reduce the tendency of the product to flute (formation of creases) during fabrication. Slitting lines are of two types; pull-through and driven. In a pull-through line, all the power for slitting is provided by the recoiler, which pulls the material from the uncoiler through the slitter. In a driven line, both the recoiler and the slitter are driven and in some cases the uncoiler. Pull-through slitters are employed for strip in the intermediate thickness range, while driven slitters are used when slitting very thin or relatively heavy gauges. The slitting of wide, hot rolled material into narrower widths makes it possible to produce, narrow, hot rolled strip for subsequent cold reduction more economically than equivalent tonnages of the same narrow strip can be rolled on a hot strip mill. Modern hot rolled shear lines include a temper mill aimed primarily at improving the flatness of the material before shearing, which increases the accuracy of the shearing operation. Shearing lines employ two different types of shears; namely, flying shears and upcut shears. Flying shears are normally used for the lighter gauges and the upcut shear for the heavier gauges. This decision is solely influenced by economic considerations for equipment. The hot rolled strip in coil form is cut to specified lengths, normally not exceeding 12 meters (40 ft.) in length and piled into packs normally not exceeding 18 tonnes (20 tons). Cooling water requirements for these various processes are limited to indirect cooling for heat exchangers. There is no direct cooling water requirement. One combination shear line and a heavy gauge shear will be housed in a building 512 meters (1,680 ft.) long by 40 meters (130 ft.) wide. The other combination shear line will be in a building 480 meters (1,570 ft.) long by the same width.

1.189
The heavy gauge shear line will be used entirely for "pleet" product. Pleet (plate-sheet) is a new product designation for light plate stock. Shearing of this product will be accomplished using a start-stop mode of operation. The shipment direct from the hot strip mill of hot rolled coils for conversion by others and outside processors will be done from an outside storage area. This area will be 520 meters (1,700 ft.) long by 60 meters (200 ft.) wide and will be serviced by gantry cranes. The coils will be received in this area on a transfer system from the hot strip mill. Gantry cranes equipped with coil lifters will move the coils to a coooling storage area. After a specified period of time the coils will be moved to another location for additional handling, if required, and shipping.

Plate Mill and Finishing

1.190

Plates will be made from cast steel slabs manufactured in the proposed steel plant. The classification of "steel plate" generally encompasses hot-rolled, wide, flat section stock with a thickness greater than four millimeters (0.16 in.) and a specific weight greater than 35 kilograms per square meter (about 7 lbs/ft. Principal uses for plates are for large fabricated structures and products such as bridges, trestles, storage tanks, pressure vessels, railroad cars, ships, line pipe, industrial machinery, welded assemblies, and a wide range of special applications. The majority of steel plates are produced in carbon steel and high strength low alloy steel grades, the principal product grades of the proposed steel plant. The plate mill is intended to have an annual capacity for rolling 1.38 million tonnes (1.52 million tons) of plate from a cast slab supply of 1.62 million tonnes (1.79 million tons) for an effective yield of 85 percent. The loss will primarily consist of sheared scrap which will be recycled back to the steelmaking furnaces and about one percent to two percent oxide scale which will be sent to the sinter plant. The plate mill rolling schedule is planned to be 18 turns per week with an average production rate of 1,475 tonnes (25 tons) per turn. The planned product mix ranges in thickness from 4.5 to 50 millimeters (0.18 to 2.0 in.), in widths from 1,200 to 3,900 millimeters (47 to 154 in.) and in lengths up to 30 meters (98 ft). The operations required to produce plate include the following: slab conditioning and storage, slab reheating, hot rolling in roughing and finishing stands, cooling and levelling, surface quality conditioning, shearing, heat treating, flame cutting, and shipping. Air pollution control equipment will be installed in the plate mill to avoid or eliminate emissions during the slab conditioning process, the operation of reheat and heat treating furnaces, and flame cutting operations. Water treatment of the plate mill process and cooling water will begin at the scale pit by removal of scale and oil and be followed by treatment to assure the water quality for recycle. The recovered scale will be sent to the sinter plant, the recovered oil sent to cleaning, and residual sludges sent to solid waste disposal.

a) Plate Mill Buildings

1.191

The plate mill and its auxiliary operations will be housed in contiguous buildings abutting the southern end of the continuous casting building and extending easterly. The plate mill buildings will have nominal widths from 24 meters (79 ft.) in its narrowest aisle, up to 39 meters (128 ft.) for each of the shipping bays, and a running distance of more than 1,150 meters (3,770 ft). The building plans call for the plate mill to have a total area of approximately 75,000

square meters (about 800,000 sq. ft.) of enclosed area. The roof height of the plate mill buildings is to be 22.5 meters (74 ft.). By using this configuration, the slabs from continuous casting can be received, conditioned, stored, heated and rolled, finished, cut to size, and shipped without any need for exterior transport vehicles to move the work in-process between step operations.

b) Slab Conditioning and Storage

1.192
Cast slabs for hot rolling to plate will be cut to length and machine scarfed, as required, at the continuous caster. They will then be delivered to the plate mill by the two 100-tonne (110-ton) slab transfer cars to either of the two parallel slab conditioning and 500°C (930°F). In one bay, slabs of critical steel grades or those requiring touchup conditioning will be processed through a slab grinder equipped with edge and surface grinding wheels. The processing dust from scarf generated during this operation will be exhausted to a bag house for cleaning. The grinder will be serviced by a 25-tonne (27.5 ton) gantry crane equipped with magnets and the bay will also be serviced by two 60-tonne (66-ton) cranes. Slabs that have been conditioned and inspected will be transferred by the 100-tonne (110-ton) transfer cars to the second bay for either storage or assembling into ordered lots for charging onto the furnace approach table. This bay will have a 25-tonne (27.5-ton) gantry magnet crane for placing slabs on the furnace charging table and two 60-tonne (66-ton) electric overhead traveling cranes for piling and handling slabs. The electric overhead cranes in both slab bays will be equipped with turnarounds, magnets and tongs. All bays will be enclosed in parallel buildings 32 meters (105 ft.) wide by 272 meters (892 ft.) long.

c) Slab Reheating

1.193
The conditioned slabs will be conveyed by table to the reheat furnace building which is to be about 36 meters (118 ft.) wide by 109 meters (341 ft.) long. The furnace charging gantry will place single slabs from piles onto the charging table where they will be conveyed to the reheating furnaces. During this process each slab will be weighed by a beam scale located in the furnace approach table. The two 200-tonne (220-ton) per hour walking beam furnaces will be about nine meters (29.5 ft) wide by 32 meters (105 ft.) long; they will heat double rows of slabs from 127 millimeters (5 in.) to 305 millimeters (12 in.) thick by 1,830 millimeters (72 in.) to 3,680 millimeters (145 in.) long. Slabs will be removed from the furnaces by extractors that will deposit the heated slabs on the furnace delivery table. Discharged slab temperatures will range from 1,150°C

(2,100°F) to 1,300°C (2,370°F). Each furnace has six top and bottom fired zones. The fuel used will be a mixture of low sulfur coke oven and blast furnace gases or No. 6 fuel oil. The furnaces are equipped with heat recuperators and exhaust stacks. The anticipated energy consumption rating of each furnace is about 80 million kcal/ (320 million Btu) per hour. For the planned throughput of slabs, this amounts to specific heating rates of 0.74 million kcal/tonne (2.7 million Btu/ton). Instrumentation and controls compatible with computer system will be provided, to ensure efficient combustion. Oxygen analyzers will be used to continuously monitor the products of combustion and automatically adjust the air required for complete combustion. These controls will limit the emissions during the heating process. Cleanout openings will be provided below the hearth line so that scale and slag can be periodically cleaned out of the furnaces and returned to the sintering plant or blast furnaces for recovery and recycling.

d) Rolling

1.194
Immediately after exiting from the furnaces, the hot slab will proceed by conveyor through a high pressure water (165 atmospheres) descaling box, equipped with top and bottom headers for removing all scale from the slab. Loosened scale will drop through the table to the mill flume system which will flush the scale to the outside scale pit. At the scale pit, entrained oil will be skimmed and pumped to a storage tank. Scale will then be removed and returned to the sinter plant for recycling. The water used in this process will be cooled and cleaned and recycled from a treatment plant and nonrecoverable sludge from the pit will be sent periodically to designated solid waste disposal areas. Descaled slabs will proceed to the rolling mill area, housed in a building 30 meters (98 ft.) wide x 457 meters (1,500 ft.) long. The four-high roughing mill stand will be equipped with two 4,500 kW (6,000-HP) drive motors. All broad siding will be done here. The slab will normally be rolled in the range from five to nine passes before it proceeds to the second stand for finishing. High pressure water descaling headers are also provided here for secondary scale removal. Mill scale from the rougher descaling will also be flumed to the outside scale pit.

1.195
After roughing, the partially reduced slab proceeds to the four-high finishing mill, driven by two 6,000-kW (8,000-HP) drive motors. The usual number of finishing passes will range from seven to 11. The finishing stand will be equipped with automatic gage control and

Gamma Ray thickness gauges on both sides. Other features that will be the on both mill include the following:

Work Rolls: 1,100 mm dia. x 4,100 mm roll face (43.3 x 161.4 in.)
Back-up Rolls: 2,100 mm dia. x 4,100 roll face (82.7 x 161.4 in.)
Post Area: 10,000 cm^2 (1550 $in.^2$)
Motor-Speed: - 40 - 100 rpm
Work Roll Bearings: Roller
Back-up Roll Bearings: Oil Sleeve
Side Guards: Both Sides
Spin Turn Tables: Both Sides
Computer Control: Screws reversal and monitoring
Descaling Water: 165 Atmospheres

1.196
Load cells will be installed on both mills with feedback of rolling loads to a process computer. This system will control the screwdown position in conjunction with thickness gauge readings after each pass. The computer rolling program for the pass of each slab will be detailed on a digital readout screen for the operator. Revision of the rolling schedule for final gage of lightweight slabs will be made by the computer to provide the proper length. The operator will manually control descale sprays, spin table rolls, and side guards. Rolls will be changed automatically by the side shift and sled method. When the sled method is used, roll assemblies will be delivered directly at the adjacent roll shop which will house a lathe, roll grinder, bearing maintenance facilities, and a shear knife grinder.

e) Cooling and Leveling

1.197
Upon completion of rolling, the rough plate travels downstream for cooling and leveling. As required, cooling sprays ahead of the leveler, with retractable overhead and fixed below-table headers, will be utilized to control plate temperature during this process. Wastewater and scale drops into the flume system will be processing through the treatment system described earlier. All product from thickness of 4.5 to 50 millimeters (0.18 to 2.0 in.) will be processed through a reversible backed-up roller leveler located 108 meters (354 ft.) from the rolling stand. The leveler will have a maximum opening of 305 millimeters (12 in.) for dummying heavier plates. Water used for roll cooling will discharge by flume to the scale pit and recycling through the service water system.

1.198
An automatic hot stamping device is located immediately after the leveler to provide plate slab identification. Identification numbers

will be changeable either manually or by process computer. After leveling and identification, products 40 millimeters (1.6 in.) and thinner will be transferred from the roller table onto a walking grid type cooling bed, 45 meters (148 ft.) wide by 75 meters (246 ft.) long. The bed will be arranged to operate in one full width or in two half widths. Space will also be provided for a second identical cooling bed, which may be installed at a later date. Discharge temperature of the product from the cooling bed will achieve a maximum of 250°C (480°F). Adjacent to the cooling bed is the heavy plate transfer, also of the walking grid type, 20 meters (65 ft.) wide by 45 meters (148 ft.) long, for transferring plates thicker than 40 millimeters to the flame cutting area. These plates may have temperatures at removal from the transfer of up to 450°C (840°F). Beyond the cooling bed are the inspection pulpits which are located above and below the cooling bed runout table. Top and bottom surface inspection with the aid of adequate lighting and defect marking is accomplished at this location. Inspectors will log results into an operation control data computer system.

f) Shearing

1.199
Following inspection, the plates are sent to the shearing department. The shearing line is housed in an aisle 36 meters (118 ft.) wide by 643 meters (2,110 ft.) long. An automatic plate layout device, consisting of a pony mechanism riding on tracks, marks ordered lengths, including test allowance and location, with paint. It receives instructions from the process computer. After a plate is marked, a 40-millimeter (1.6 in.) by 4,100-millimeter (160 in.) crop shear squares up front and back ends and parts, if necessary or desirable. This shear is of the curved knife design and will cut up to 80 kg/mm^2 (114,000 lb/in^2) cold tensile strength material and will include a quick knife-changing device. A synthetic belt scrap conveyor, reinforced with steel bars bolted to the belt, mounted behind and below the bottom shear knife, carries scrap ends to the scrap shear for cutting into charging box size. The cut scrap is delivered to scrap bins outside the building for loading into trucks and return to the steelmaking process.

1.200
Located 40 meters (131 ft.) downstream from the crop shear is a computer controlled flying type, rotary stencil marker that automatically stencils customer name, specification, and other necessary information onto the plate surface. After stencilling, the stock proceeds another 40 meters (131 ft.) to a 40-millimeter (1.6 in.) by 4,100-millimeters (160-in.) rolling cut twin side shear capable of cutting finished widths from 1,200 millimeters (47 in.) to 3,900 millimeters (154 in.). It has one stationary and one moveable

housing and is capable of making 30 cutting strokes per minute, at a trimming speed of 42 meters (138 ft.) per minute on up to 80 kg/mm^2 (114,000 psi) cold tensile strength material. Plates are aligned with magnets and centered with the aid of laser beam guidelines. Scrap is delivered by two chutes to a conveyor belt similar to that previously described, and deposited outside the building. A quick knife-changing device is also utilized here. Immediately after the side shear is a curved knife, traversible slitting shear of 40-millimeter (1.6 in.) capacity, synchronized with the twin shear. This permits rolling double width plates in multiples of 1,220 millimeters (48 in.) to 1,956 millimeters (77 in.), resulting in higher yields and production on narrow plate sizes.

1.201
An X-ray thickness gage is located after the side and slitting shears for checking the thickness of each plate and is linked to the process computer. A 20-tonne (22-ton) cross bay magnet equipped transfer gantry with a 30 meters (98-ft. span) is situated 40 meters (131 ft.) beyond the thickness gage. This crane separates and holds back slit plates for shearing and transfers plates to the second end shear and also to and from the heat treat area. A 40 millimeter (1.6-in.) by 4,100 millimeters (160-in.) curved knife end shear, a duplicate of the crop shear, follows for cutting into ordered lengths. Moveable side guards square the plate for shearing, and measuring rolls are utilized for cutting to length. Scrap collection and transfer is the same as described for the cropshear. A tail-end crop pusher will clear the last crop from the shear block. Necessary specimens for tests are procured at this location. A second end shear is located adjacent and parallel to the one just described and will be the same in all respects. It will be fed by the previous described gantry either from the shear line or the heat treat bay. Space is provided ahead of this shear for a complete second shear line in the future.

1.202
After shearing, plates proceed through an automatic computer-controlled die stamping machine that impresses the required identification on each plate. Dimensional inspection for length and width is next accomplished automatically by a combination of electric sensors, magnetic rollers, and overhead scanning devices. Immediately following is a computer-controlled labeler that prints adhesive labels and applies them to each plate, usually on the edge for identification in piles. A second 20-tonne (22-ton) cross bay transfer gantry equipped with spreader beam and magnets is located after the labeler. This crane is utilized to remove plates from the roll line for either close inspection or for later reconditioning or reflattening.

1.203
Plates needing no further processing are delivered straight ahead to the cross bay shipping buildings. Products requiring further processing, such as reflattening, bottom grinding, etc., are diverted by the 21.5(103-ft.) wide, lift and carry transfer to a parallel line equipped with a turnover device and cold leveler. Those plates requiring bottom reconditioning will be turned over and delivered to the second lift and carry transfer where grinding can be done. This transfer also brings all processed plates back into the shear delivery line and into the shipping bays. The backup cold leveler is equipped with automatic entry and roll bending.

g) Heat Treating

1.204
A normalizing furnace is located in a finishing aisle 36 meters (118 ft.) wide by 643 meters (2,110 ft.) long adjacent and parallel to the shearing building. Plates to be normalized are transferred to this area either by the heavy plate transfer or by the 20-tonne (22-ton) gantry ahead of the end shears. A 20-tonne (22-ton) charging gantry, equipped with magnet handling feeds the untreated plates onto the run-in table for normalizing at approximately 300°C (570°F). The furnace roller hearth will have inside dimensions of 55 meters (180 ft.) in length and four meters (13 ft.) in width. Plates to be normalized will be processed through the continuous roller hearth furnace at maximum temperatures of about 900°C with either unmixed low sulfur COG or mixed with blast furnace gas. The rate of energy of the normalizing furnace is about 265 million kcal (106 million Btu) per hour or about 0.9 million kcal/tonne (4.0 million Btu/ton) for the expected production rate. The furnace will be divided into multiple zones with a stack to the atmosphere from each zone. Instrumentation and controls will be provided for efficient combustion, which will limit stack emissions. Oxygen analyzers will be used to continuously monitor the products of combustion and make automatic adjustments required for complete combustion. At this point, the product is delivered to a roller type transfer car which transfers it to the parallel cooling table. After cooling, the plates are removed by the EOT crane and tests are cut by burning. For final cutting to ordered sizes, sheared product will be returned to the shear line by the 20-tonne (22-ton) cross bay gantry or to flame cutting in the same bay.

h) Flame Cutting

1.205
Flame cutting operations are also located in the 36-meter (118 ft.) wide by 643-meter (2,110-ft.) long finishing aisle, adjacent and parallel to the shearing building. Four 20/20-tonne (22/22-ton)

capacity overhead cranes to service flame cutting and the heat treating facility are located in this building. Negligible emissions are expected from the flame cutting operation because of the use of fumeless burners. All flame cut product reaches this area by means of the heavy plate transfer car. Product is removed from the runout table by the cranes equipped with spreader beams, C-hooks, and magnets. Cooling stands are located in this area for piling and cooling. Flame cutting is accomplished on a 98-meter (322-ft.) long burning bed serviced with four motorized gantry burning machines equipped with multiple torches. Product is shipped by rail from the depressed tracks. This area is also equipped with necessary tools for grinding, chipping, welding, and inspection.

i) Shipping

1.206
There are four shipping bays 224 meter (735 ft.) long by 39 meter (128 ft.) wide. Each will be serviced by two 20/20-tonne (22/22-ton) electric overhead cranes equipped with spreader beams, magnets, and plate hooks. Finished plates delivered to the shipping bays will be aligned and piled by any one of eight, 18-meter (59-ft.) long side pilers. The two pilers in each bay are capable of operating as one unit for longer plates. Finished plates are transported out of the piler zone by a transfer car to permit the piler to continue to operate. Four depressed rail loading trucks cross the shipping bays and permit spotting 32 railroad cars within the shipping buildings. A mobile car mover can shift other cars into and out of the buildings as required. A truck loading road passes through either end of the shipping bays with a traffic loop will be constructed to facilitate movement.

Scrap Handling

1.207
The plant material balance has been designed so that the iron and steelmaking operations will be independent from purchased scrap. The metallic values will be reclaimed from the blast furnace slag and Q-BOP slag and returned to the blast furnace for recovery. All steel scrap generated at the various plant facilities will be collected, cut to size when necessary, and recycled to the Q-BOP. The steelmaking furnace charge-design is based on the supply of revert scrap alone so that there will be no need to purchase scrap, nor will any scrap generated in-plant be sold outside. Iron units will be reclaimed from any air-cooled blast furnace slag at the slag processing plant. The slag scrap contains about 70 percent iron and amounts to approximately three percent of the hot metal produced. Reclaimed slag iron will be brought from the slag processing area to

the stockhouse. There, it will be stored in a bin, and later subjected to the general charging procedure described in the section on Blast Furnace Operations. At the same slag processing plant, iron is also recovered from steelmaking slag. Recovered rates range from two percent to four percent of the total raw steel production and for the proposed plant could amount to as much as 290,000 tons. Although the steelmaking slag is kept separate from the blast furnace slag, the metal recovered from both is recycled to the blast furnace.

1.208
Steel scrap is generated at a number of locations in the plant. It takes the form of croppings, trimmings, and rejects exhibiting either physical defects or chemical composition that is not within specification. A yield of 85.75 percent is expected from the liquid steel to shipped products. The 14.25 percent difference between liquid steel and finished products includes 2.5 percent mill and scarfing scale and dust, as well as 11.75 percent scrap. The scale and dust will be recycled through the sinter plant to recover the iron. Raw steel production of 6.8 million tonnes (7.5 million tons) per year thus provides 800,000 tonnes (880,400 tons) of scrap. Together with metallics recovered from slag, total scrap quantities amount to more than one million tonnes (1.1 million tons).

1.209
The hot strip mill is equipped with a rotary drum crop shear for cutting the rolling stock ends. An inclined chute guides the material into a crop box which consists of a dual pit. One pit will be used for the box collecting the crop while the other pit houses an empty box. The latter will be shifted to the collection pit by a hydraulic ram when the full box is removed. The full box will then be loaded onto a truck and taken to the Q-BOP shop scrap yard. The plate mill is equipped with shearing devices for cropping and trimming in three locations. A flame-cutting station is also available. Synthetic belt scrap conveyors, reinforced with steel bars bolted to the belt, carry the scrap to the scrap shear for cutting into charging box size. The cut scrap is delivered to scrap bins outside the building for loading into trucks and return to the scrap yard located next to the Q-BOP shop. On arrival at the scrap yard, the scrap is dumped directly into one of three scrap charging boxes or into scrap bins. Two 25-tonne (27.5-ton) capacity scrap loading cranes will be available to charge and trim the boxes to the required weight, as indicated by scales on which the transfer cars carrying the scrap boxes will rest.

Onsite Ancillary and Support Systems

Offices

1.210
The main office facilities for the proposed plant will provide sufficient space for administrative functions and engineering support activities as well as staff services required by the plant. The main office will occupy an area near the boundary line between the States, and near Route 20. Departmental offices will be located near the respective plant operations under its control. Construction offices would be temporary buildings or office trailers provided by individual contractors on an as-needed and where-needed basis. It is impossible to accurately estimate how many construction offices would be located on the site until plant design has been finalized and contracts have been let. The construction area is actually a number of areas of concentrated activity located throughout the cleared portions of the site. These areas would surround individual plant components where work is being accomplished (e.g., the blast furnaces), and would incorporate the office trailers, minor maintenance facilities, construction equipment storage areas, chemical toilets, etc., that are necessary to support the construction workers on the scene.

Laboratories

1.211
A laboratory will be provided in the Coke Oven area for the testing and quality control of the metallurgical coals and coke. A metallurgical laboratory will be provided in the area between the blast furnaces and the steelmaking shop for the testing and quality control of the iron from the blast furnaces and steel from the steelmaking shop. Samples from these operations will be transported to the laboratory by pneumatic tube.

Emergency

1.212
A centrally located Fire Station will be provided, having an alarm system tied in to all operating departments within the plant. Two modern high pressure pumpers will be provided. Five hydrants tied into the plant water system will be placed at strategic locations throughout the facility to support fire fighting apparatus. Fire hose reels and the various types of fire extinguisher bottles will be provided throughout the mill. Electrical, hydraulic, oil, etc. systems in basements, rooms, and houses will be equipped with automatic fire-extinguishing systems consistent with the type of possible fire source involved. Water mains for fire protection service would be constructed concurrent with other plant facilities and would be

located in a common corridor with sanitary and storm water sewage systems, and wastewater discharge mains. The main would connect to the water works on the lakeshore. It is probable that these facilities would be brought into operational status early in the plant construction period.

1.213
Plant protection gates will be provided at each plant entrance for the control and check of all employees and visitors entering and leaving the plant. A truck-checking gate will be provided for the control of all trucks entering and leaving the plant and scales will be installed to weigh empty and loaded trucks. A communications system will be provided between the truck-checking gate and the various shipping warehouses.

1.214
Emergency medical facilities will be dispensed from a central location within the plant and two fully equipped medical vehicles will also be provided. Stretchers and first-aid kits will be installed at strategic locations throughout the plant.

Warehouses

1.215
Required inventories of consumable supplies and replacement parts specific to each operation will be maintained at, or nearby, each working area. In addition, primary stocks of these materials will be stored in central warehouse facilities. The warehouse will occupy areas along the main access road toward the east end of the plant and to the south of the plate mill. The location of warehouse facilities in these areas provide optimal access for incoming truck and rail shipments. Trucks operated by the applicant will transfer stock from warehouse to local shop inventories via the internal plant road system. Warehouse-stocking quantities will be governed by the nature of the stored material, the frequency of its use, and the size and regularity of economic shipments.

Service Shops

1.216
In addition to the production operations, the plant will have a number of service shops for maintenance, repair, and rebuilding of plant equipment and facilities. Maintenance functions specific to the individual operations, such as roll resurfacing equipment, will be the responsibility of that operating department. Services which are general to the whole plant will occupy building space located along the main roadway toward the east end of the plant to the south

of the plate mill. There will be separate service shops for mechanical equipment, hydraulic systems, electrical machinery, and instruments. In addition, separate garage facilities will be provided to maintain and repair company vehicles, both fuel-powered and electric battery driven units, as shown in Table 1-18.

Personnel Facilities and Buildings

1.217
Four parking lots will be provided within the plant site and adjacent to the main roads for employee parking. The lots will be fenced and guarded. These permanent lots will be located for convenient access to plant facilities. They would be paved (possibly with multiple layers of slag or locally-obtained aggregate) and be equipped with storm sewers and lighting. Lighting will be provided by an underground conduit system.

1.218
During the construction period, the applicant would provide parking for private automobiles in one to three temporary parking lots located on site where interference with construction activities would not occur. The applicant anticipates that workers will be transported from these parking lots to the work areas by individual Contractors. U. S. Steel estimates that two to three people will occupy the average car arriving on site. If practicable, the temporary lots will be constructed by grading the area so that it is level and placing a surface of locally obtained aggregate on the ground. Water would be spread over the area by sprinkler truck to control dust as needed. Associated with each permanent parking lot, four wash and locker buildings will be provided, complete with showers and sanitary facilities for the use of all employees. Employees whose job requires changing from street clothes to work clothes will be provided a double locker, one for clean clothes and one for dirty clothes. The wash and locker buildings will be located adjacent to the parking lots and as and close to the mill work areas as possible to minimize the distance employees have to traverse from the buildings to their work areas.

Food Services

1.219
The main office building will be equipped with a lunch room for the use of management employees. In addition, a commissary will be provided for the storage of food supplies and the stocking of food for food dispensers within the plant. Mechanized food dispensing stations providing both hot and cold foods will be installed in those areas of the plant where employee density per unit area is highest. At other locations only cold food will be dispensed. During the

Table 1-18

Mobile Equipment Requirements by Work Area

Coke Ovens & By-Products Plant

No.	Type	Capacity	Power	Service
4	Hand Truck	2000 lb	Battery	Miscellaneous
2	Fork Lift	6000 lb	Propane	Pelletized Brick & Supplies
3	Motor Scooter	4-wheel	Gasoline	Maintenance
1	Front End Loader		Diesel	Clean-up
1	Brush Track Sweeper		Diesel	Clean-up
1	Sheeps-Foot Roller		Diesel	Coal Storage
1	Bulldozer		Diesel	Coal Storage
1	Mobile Boom Crane	15 ton		Door and Jamb Repairs
2	Portable Scissors Lift		Electric	Door Maintenance

Sinter Plant

No.	Type	Capacity	Power	Service
1	Floor Sweeper		Battery	Clean-up
1	Fork Lift	8000 lb	Propane	Pelletized Supplies & Swand; Pallet Handling
1	Fork Lift	3000 lb	Propane	Pelletized Supplies Handling
1	Front End Loader		Diesel	Miscellaneous Material Reclaim and Sinter Reclaim from Ground Storage
1	Mobile Boom Crane	5 ton	Electric	Maintenance

Table 1-18 (Continued)

Blast Furnaces

No.	Type	Capacity	Power	Service
1	Floor Sweeper		Battery	Clean-up
4	Fork Lift - Special	4000 lb	Propane	Tuyere Changing
2	Fork Lift	8000 lb	Propane	Palletized Supplies
2	Front End Loader		Propane	Cast House Clean-up
2	Front End Loader		Diesel	Slag Handling
1	Mobile Room Crane		Diesel	Maintenance
1	Dump Truck		Gasoline	Clean-up

Steelmaking Shop

No.	Type	Capacity	Power	Service
1	Floor Sweeper		Battery	Clean-up
2	Fork Lift	6000 lb	Propane	Palletized Supplies
2	Fork Lift	4000 lb	Propane	Brick for Furnace Relines
1	Front End Loader		Diesel	Slag Handling
2	Front End Loader	15 cu ft	Diesel	Clean-up & Bulk Materials
2	Gradall		Diesel	Furnace & Ladle Lining Removal
6	Dempster Dinosaur		Diesel	Scrap Box Handling
1	Lift-A-Loft		Propane	Maintenance Scaffold
2	Breezewagon			Furnace Cooling
1	Mobile Boom Crane	40-ft lift		Maintenance
1	Platform-type Scotter			Maintenance
3	Pallet Lifter		Manual/ Hydraulic	Maintenance

Table 1-18 (Continued)

Ladle Reline

No.	Type	Capacity	Power	Service
2	Fork Lift	6000 lb	Propane	Palletized Brick

Burnt Lime Plant

1	Front End Loader	Small		Clean-up
1	Dozer	D-8		Stone Pile & Clean-up

Continuous Casting Shop

1	Floor Sweeper		Battery	Clean-up
1	Fork Lift	6000 lb	Propane	Palletized Supplies
1	Front End Loader		Diesel	Clean-up

Hot Strip Mill

1	Floor Sweeper		Battery	Clean-up
2	Fork Lift	10,000 lb	Electric (Battery)	Palletized Supplies
1	Fork Lift	10,000 lb	Electric (Battery)	Miscellaneous Roll Shop
2	Dempster Dinosaur	15 cu yd - 30 ton	Diesel	Scale Handling (incl. Plate Mill)
3	Motor Scooter	4-wheel	Battery	Personnel
1	Mobile Boom Crane		Battery	Maintenance
1	Tow Tractor		Battery	Roll Transfer Car
2	Kamag Tractor	100,000 lb		Scrap, Crop Ends, Cobbles, and Coils
4	Ram Tractor	85,000 lb	Diesel	Coils
1	Front End Loader		Battery	Furnace Slag Clean-up

Table 1-18 (Continued)

Hot Strip Mill (Cont.)				
No.	Type	Capacity	Power	Service
1	Front End Loader		Propane	Scale Handling (incl. Plate Mill)
1	Dempster Dinosaur		Diesel	Rubbish Hauling
Hot Rolled Finishing				
4	Motor Scooter	4-wheel	Battery	Personnel
1	Floor Sweeper		Battery	Clean-up
1	Fork Lift	6000 lb	Battery	Packaging Supplies
4	Fork Lift	25,000 lb	Battery	Sheet Handling
2	Ram	50 ton	Battery	Coil Handling
2	Ram	50 ton	Battery	Coil Handling
1	Flat Bed Truck		Diesel	Roll Handling (to Roll Shop)
1	Mobile Boom Tractor		Battery	Maintenance
1	Dempster Dinosaur		Diesel	Rubbish Handling
Plate Mill				
3	Motor Scooter	4-wheel	Battery	Personnel
1	Floor Sweeper		Battery	Clean-up
1	Fork Lift	6000 lb	Propane	Palletized Supplies
1	Fork Lift	16,000 lb	Diesel	Car Blocking Lumber & Miscellaneous
1	Fork Lift	46,000 lb	Diesel	Slab Handling
1	Front End Loader		Diesel	Clean-up
1	RR Car Mover		Diesel	Spotting RR Cars
1	Bucket Lift	1-1/4 cu yd	Diesel	Maintenance

Table 1-18 (Continued)

No.	Type	Capacity	Power	Service
Plate Mill (Cont.)				
1	Mobile Crane	8500 lb	Diesel	Maintenance
*	Dempster Dinosaur		Diesel	Scrap Box Handling
Central Maintenance Shops				
2	Fork Lifts	4000 lb	Propane	Machine Shop
2	Pick-up Truck	1/2 ton	Gasoline	All Shops
2	Tow Tractor	Medium	Propane	All Shops
1	Mobile Crane	10 ton	Battery	Fab. Shops
1	Mobile Crane	4 ton	Battery	Elect. Shop
1	Fork Lift	4000 lb	Propane	Elect. Shop
2	Tow Tractor	Medium	Propane	Maintenance Material Yard
1	Truck Crane	5 ton	Gasoline	Spares Control
1	Fork Lift	8000 lb	Propane	Spares Storage
1	Tractor Trailer Lowboy	50 ton	Gasoline	Assemblies to Shops
2	Flat Bed Truck	10 ton	Gasoline	Assemblies to Shops
2	Flat Bed Truck	5 ton	Gasoline	Assemblies to Shops
Mechanical Field				
3	Air Compressor		Diesel	
2	Tractor Shovel	1/3 cu yd	Diesel	
2	Welder (Tow Around)		Electric	
2	Jeep Welder		Gasoline	
3	Pick-up Truck		Gasoline	Transport Men and Material to Job Sites
2	Panel Truck		Gasoline	Fitted for Service Calls

(*Included in Steelmaking Shop.)

Table 1-18 (Continued)

No.	Type	Capacity	Power	Service
Mechanical Field (Cont.)				
1	Aerial Platform	65 ft	Gasoline	
1	Aerial Platform	50 ft	Gasoline	
2	Fork Truck	6000 lb	Propane	
1	Mobile Crane	10 ton	Gasoline	
1	Mobile Crane	15 ton	Gasoline	
1	Mobile Crane	30 ton	Gasoline	
Masonry Services				
2	Tractor Shovel	1/3 cu yd	Diesel or Gasoline	
6	Fork Truck	4000 lb	Propane	
3	Fork Truck	6000 lb	Propane	
3	Pick-up Truck		Gasoline	
Electric Field (Includes power house, air sep. plant & water treatment)				
1	Aerial Platform	60 ft	Gasoline	
1	Aerial Platform	50 ft	Gasoline	
1	Tow Tractor		Propane	
1	Line Truck		Gasoline	
3	Panel Truck		Gasoline	
3	Pick-up Truck		Gasoline	
Metallurgical				
1	Panel Truck		Gasoline	Test Samples
Fire Station				
2	Pumper		Diesel	
Medical Services				
2	Ambulance		Gasoline	

Table 1-18 (Continued)

Plant Protection

No.	Type	Capacity	Power	Service
3	Automobile		Gasoline	

Accounting

No.	Type	Capacity	Power	Service
2	Panel Truck		Gasoline	Mail Delivery

Source: United States Steel Corporation.

construction period, mobile canteen trucks will probably be utilized to augment food supplies of individual workers.

Access Roads and Relocation of Roads

1.220
Construction of the steel plant on the proposed site will require the clearing, grading, and filling the area presently occupied by portions of several roads which lie north of the Conrail tracks (which form the southern boundary of the site). Sections of existing roads which are not physically destroyed during site preparation will be abandoned to remain non-functional. Table 1-19 lists the existing roads which would be altered or no longer be accessible and functional.

1.221
The proposed plant will require construction of a system of roads to facilitate transportation of personnel and material within the plant, and access roads to major external transportation arteries. Once site preparation is underway, the area would be fenced so that access to the site can be controlled and limited to one or two checkpoints. After fencing, construction of the temporary access roads would be initiated. Within the site area, permanent roads would not be built until much of the facility construction is completed. Travel within the construction site would tend to follow specific routes between construction sites and supply and administrative areas, but no improved roads would be built specifically for use during construction. It is estimated on the basis of past experience that some 30 miles of improved roads would be constructed within the plant by the time it becomes operational. (1-2) Temporary access roads would be constructed in a manner that would provide enough support to allow for the transportation of all construction material and components required for the plant. The method of construction would be to grade down to a firm base, place a good aggregate base, and water the surface.

1.222
Steps in the construction of the permanent roads would include: grading, installation of ditches and culverts, (storm sewers at intersections), placing of subbase and base using gravel or slag, paving, and lighting. At stream crossings, culverts would be installed and railroad crossings would be on overpasses. Culverts would be designed according to the stream size and could be of several varieties including reinforced concrete and corrugated steel. In either case, construction would entail excavation of the stream bed and placement of the culvert, followed by final filling and grading of the road.

Table 1-19

On-Site Roads Affected by Construction

Name	Length Affected (Miles)
Lake Road	3.1
Childs Road	1.4
Lynch Road	0.6
Thompson Road	1.3
Stateline Road	1.5
Rudd Road	1.6

Source: Arthur D. Little, Inc.

Fuel Storage

1.223
Fuel will be stored in diked, above-ground steel tanks. Construction of storage areas will involve grading, leveling, diking, installation of gravel or slag base, erection of steel tanks, installation of piping, and controls. The location of the storage area has not yet been determined, but it would probably not be located on a filled area since a stable foundation is required.

Utilities

Electrical Energy

a) Power and Energy Requirements

1.224
A substantial amount of electrical energy will be required to operate the equipment in the various facilities within the proposed Lakefront Plant. The total annual electrical energy requirement for the Lakefront Plant is estimated to be 2600 x 10^6 kilowatt hours, which is equivalent to 380 kilowatt hours per tonne (345 kWh per ton) of raw steel (see Table 1-20). Total power demand for a given 15-minute period is 390 megawatts, based on a 1.1 diversity factor. The "diversity factor" is the ratio of the total maximum theoretical power demand to the anticipated actual maximum demand (all of the plant's electrical equipment would not be in operation at the same time). Total annual electrical energy requirements and the total power demand for the facilities with the Lakefront Complex are shown in Table 1-20.

b) Electrical Power Generation System

1.225
To meet plant power demands an onsite power plant fired by coal, blast furnace gas, and recovered Q-BOP off-gas will be built and supplemented by outside energy sources. Coal will be received by rail, unloaded with a rotary car dumper, and then carried to the bunkers in the power plant building by belt conveyor. A long-term reserve coal storage pile will be located near the power plant. Lean fuel gases will be piped directly to the power house from the gas cleaning equipment at the process sources. The proposed power plant will include the following major components: coal pulverizers, boilers, two 50-megawatt turbine generators, steam condensers, boiler feedwater heaters and pumps, draft equipment, and auxiliary equipment required for plant operation. The plant steam condensers will be cooled by indirect cooling water which will be recirculated through a cooling tower. Approximately 25 percent of the electrical energy

Table 1-20

Electrical Energy Requirements and Power Demand at the Lakefront Complex

Facility	Electrical Energy Requirements (kWh x 10^6/yr)	Power Demand (Megawatts)
Raw Material Handling	222.6	28.6
Sinter Plant	83.2	13.5
Coke Oven Battery	256.8	37.1
By-product Facility	32.5	4.7
Blast Furnace	110.5	16.0
Power House	130.0	18.8
Oxygen Plant	316.8	55.5
Burnt Lime Plant	19.2	2.9
Steelmaking	170.0	29.8
Continuous Caster	203.2	31.1
Plate Mill and Auxiliaries	149.0	32.7
Hot Strip Mill and Auxiliaries	498.9	103.9
Hot Strip Mill Finishing Facilities	43.0	8.4
Services, Utilities, Lighting	357.5	46.0
Total	2593.2	429.0
Total Power Demand With 1.1 Diversity		390.0

Source: United States Steel Corporation.

required by the Lakefront Plant will be supplied by the onsite electrical power generation. The applicant plans to accomplish this by constructing a 50-megawatt power station utilizing three coal-fired boilers during the first phase of plant construction. During the second phase two more boilers will be added bringing the total onsite power generating capacity to 100 megawatts. Electrical energy produced by onsite generation will be utilized as the primary power source for the power generation auxiliary equipment and for the main pumphouse. Emergency backup power to the blast furnaces will be provided from this source. Also, the 13.8 kilowatt power output will be stepped up to 138 KV and tied into the subtransmission system described later in this section. The remaining needs will be purchased from a local electric utility company. Particulate and sulfur dioxide emissions from the power plant will be controlled. Most likely, the particulates will be removed by the use of electrostatic precipitators while sulfur dioxide will be controlled either by limiting the coal to low sulfur content or by operating a flue gas desulfurization (FGD) system to provide the necessary control of sulfur dioxide. If lime is used for the removal of sulfur dioxide, an area for lime storage and preparation will be provided. Nitrogen oxide emissions from the boiler will be minimized by proper boiler design.

1.226
Solid waste generated by the power plant include fly ash and bottom ash resulting from the burning of coal and the sludge generated by the sulfur dioxide control system. Fly ash and bottom ash, the inorganic product of coal combustion, contains a number of heavy metals of varying solubility. If a lime-based system is used for sulfur dioxide control, the resultant sludge will principally contain calcium sulfite and calcium sulfate and a small amount of fly ash. These wastes will be hauled to designated onsite solid waste disposal areas. The largest wastewater stream from the power generation system is the cooling tower blowdown, which contains dissolved solids and some suspended solids. In addition, there are also a number of much smaller and intermittent wastewater streams including discharges from the bottom ash transport water recycle system, periodic discharges of ion exchange regeneration brine, blowdown of boiler water containing dissolved salts, and miscellaneous other waste streams such as floor drainage and ash quench water. The combined wastewater streams are discharged to the main wastewater collection system and treated prior to discharge.

c) In-Plant Power Distribution System

1.227
<u>Bulk Substation</u> - The bulk substation will be located in the southwest corner of the plant site, and it will receive electrical

power from the utility company at 345 kilovolts. Substation transformers will step the voltage down to 138 kilovolts. All equipment will be outdoors, including the utility company's 345-kilovolt oil-immersed circuit breaker, U. S. Steel's transformers, and U. S. Steel's 138-kilovolt oil-immersed circuit breakers.

Subtransmission - Power will be transmitted from the bulk substation to the distribution substations via an overhead 138-kilovolt dual circuit subtransmission system. Each circuit will have a full capacity of 240 million volt amps. Initially, a radial arrangement of subtransmission circuits will be provided with design consideration given to a future ring network or loop system.

Distribution Substation - The plant will initially be divided into seven load areas or distribution substations. Each substation will be serviced from a dual circuit subtransmission system and will be provided with two 138-kilovolt to 13.8 kilovolt transformers, each of which has the capacity to carry the entire substation load.

Distribution System -The 13.8-kilovolt feeders at each load area will be run underground to the required double-ended load center substations for utilization.

Transformers and Capacitors - The majority of the transformers will be located outdoors to minimize the heating load and will contain mineral oil as the insulating medium. Load center substations will be used indoors at various locations. These transformers will be insulated with dielectric silicone liquids with a high-fire point. Silicone or other approved self-extinguishing material will be used as the insulating medium. During plant construction, the applicant intends to bring in temporary power at the west end of the plant site.

Water Distribution

1.228

All makeup water required by the plant will be obtained from Lake Erie through a submerged water intake structure and pumping system. The water intake will be located about 5,000 feet offshore and will be connected to the site by a 72-inch diameter pipeline placed in a trench in the lake bottom. It will be designed to have an average intake velocity of 0.26 feet per second. Each intake head will be equipped with a velocity cap and intake ports will be fitted with stationary screens. The pumping system located in the vicinity of the shoreline will supply water to the various parts of the plant. Final intake design and location will be determined through the NPDES permitting program, and may differ slightly from the conceptual

design parameters discussed in this EIS. A more complete description of the intake system is presented later in this chapter.

1.229
The proposed Lakefront Plant will require a raw water intake (at peak production) of 14,800 m^3/hr (65,100 gpm), which, due to the high degree of water recycling, is only eight percent of the total water recirculation rate of 185,000 m^3/hr (814,000 gpm). The three main categories of water usage and estimated percent of total usage are (1) closed system cooling 12 percent, (2) indirect system cooling 48 percent, and (3) process water 40 percent. Of the 14,800 m^3/hr (65,100 gpm) taken into the plant, 3,700 m^3/hr (16,300 gpm) is lost by evaporation and cooling tower drift, so that the total plant wastewater discharge will be 11,100 m^3/hr (48,800 gpm). The magnitude of plant water usage can be roughly determined from the wastewater flow rate data presented in Table 1-21.

1.230
Most of the water is used directly as it is drawn from the lake. Only a small fraction of the total water intake, that intended for the potable water supply and for boiler feedwater, is treated prior to use. The potable water supply will be subjected to suspended solids removal and disinfection, while the boiler feedwater will be subjected to suspended solids removal and demineralization. The potable water supply system will be segregated from the general purpose water supply system. Potable water will either be purchased from Conneaut or obtained from an onsite treatment plant.

Sewers

1.231
An extensive sewer system will be provided throughout the proposed Lakefront plant to collect and transport wastewater to various onsite treatment facilities. The coke plant, sinter plant, blast furnaces, steelmaking plant, continuous caster, and strip mills will be provided with individual process wastewater treatment plants and each will have its own sewer system for the collection of process wastewater. In-plant sanitary wastewater will be collected by a separate sewer system and sent to the onsite sanitary wastewater treatment system. A separate sewer system will transport cooling tower blowdown from the various cooling towers located within the plant to the main wastewater outfall. Contaminated stormwater runoff from storage areas and other sites will be collected by a sewer system and transported to the appropriate treatment facility. Stormwater runoff not requiring treatment will be collected by a separate sewer system and discharged directly to Lake Erie through the plant outfall. All of the effluents from the various onsite wastewater treatment facilities will be collected by a central sewer

Table 1-21

Proposed Lakefront Plant Wastewater Discharge Flowrates(1)

Facility	Flow Rate (m^3/hr)	Flow Rate (gpm)
Coke Plant	237	1,043
Sinter Plant	271	1,192
Blast Furnace	443	1,949
Steelmaking	279	1,228
Continuous Caster	1,042	4,585
Hot Strip Mill	1,297	5,707
Plate Mill	337	1,483
Central Shops and Offices	100	440
Sanitary Wastewater	60	264
Miscellaneous Service Water	354	1,558
Total Cooling Water Blowdown	6,680	29,390
Total Plant Discharge	11,100	48,800
Summary of Water Use		
Total Intake Volume	14,800	65,100
Total Wastewater Discharge	11,100	48,800
Water Lost through Evaporation and Drift	3,700	16,300

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(1) Based on capacity production rate.

Source: United States Steel Corporation.

system discharged as a single wastewater stream through the plant wastewater outfall.

Gas/Oil

1.232
No external sources of natural gas or other gaseous fuel will be required by the proposed Lakefront Plant. Fuel oil will be used as a supplemental fuel for the strip mill and plate mill slab reheating furnaces and as a backup fuel for the lime plant and sinter plant. The fuel will be stored onsite in unpressurized oil storage tanks. Diesel fuel and gasoline will be required to power in-plant locomotives, trucks, and other mobile equipment and will be stored onsite in tanks. All fuel storage tanks will be designed and constructed so as to conform with all applicable safety and environmental regulations. The principal fuels distributed within the plant will be process by-product gases including coke oven gas, the blast furnace top gas, and the Q-BOP off-gas.

Communications

1.233
Telecommunications into and out of the proposed Lakefront Plant will be via conventional telephone service that will be provided by the telephone company serving the Conneaut area. There will also be an in-plant telephone network that will provide communication between the various operation areas. It is likely that several small radio transmitters will be required to maintain communications. Should these be installed, licenses will be obtained from the Federal Communications Commission (FCC) prior to operation.

Air Separation Plant

1.234
An air separation plant will be built as part of the first construction phase. Oxygen, nitrogen and argon will be separated in sufficient quantities to meet the needs of the proposed facility. The plant will produce about 1,800 tonnes (1,980 tons) of high purity oxygen per day at an energy demand of 450 kWh/tonne (410 kWh/ton), and quantities of nitrogen and argon corresponding to their relative concentration in the ambient atmosphere. The oxygen steelmaking furnaces are the main users of oxygen, and generally require about 0.075 tonne per tonne which amounts to 1,400 tonnes (1,540 tons) per day of oxygen. Another 400 tonnes (440 tons) will be required by the scarfing machines, flame-cutting stations and general maintenance operation. Oxygen will not be used to enrich the wind in the blast furnace. Nitrogen will be used as a purging agent in the blast furnaces continuous top charging system, the hot coal larry car

charging, the Q-BOP gas recovery system, in casting operations and for blanketing storage tanks in the by-product plant. Argon will be used as required to stir the molten steel in the ladle prior to casting.

Steam

1.235
The boilers at the powerhouse will produce the steam which will be used to drive the blowers generating the wind in the blast furnaces. It will provide sufficient steam to meet equipment operation needs within the various plant process operations. In addition, several individual process operations will have waste heat recovery, so that a portion of that energy will be converted to steam for local use.

Building Space Heating

1.236
Space heating of buildings for personnel comfort and protection of equipment and supplies during the winter season will be provided by either steam or electric heaters. The steam will be produced by the boilers at the powerhouse and piped by a plantwide system to the areas of use. Remote buildings not on the central steam system will have electric space heaters installed, as appropriate.

Other Utility Services

1.237
Other utility services such as compressed air lines or vacuum lines will be provided as required by specific operating departments.

Utility Requirements During Construction

1.238
The responsibility for provision of temporary utilities at the work sites would be split between the individual Contractors and U. S. Steel. No temporary outdoor lighting is envisioned because no night work is contemplated. Once the buildings are erected and inside work starts, temporary lighting which meets OSHA standards would be provided. Bottled water and chemical toilet service would probably be handled by each Contractor. It is uncertain as to how construction/demolition solid wastes would be handled, but it is likely that a single Contractor would be hired to haul such material offsite to a disposal area. Phone conversations by the applicant with operators of the Lakeview and Doherty landfills on Wednesday, 5 October 1977, indicated a willingness to accept such wastes for disposal. Alternatively, combustible material could be disposed of by open-pit incineration, and non-burnable debris would be used as fill. Lubrication and fueling of equipment would be the responsibility of individual Contractors and no centralized facility

for this activity is envisioned. At the Contractor's option, he could arrange for onsite fuel storage, or could arrange to have a subcontractor make daily deliveries. Should he desire to have his own onsite storage area, it would be located in an area determined to be safe by U. S. Steel Construction Management personnel. Provisions would be required to prevent spills from reaching any water bodies. Onsite equipment storage and maintenance would probably be minimal; only minor repairs would be accomplished on site.

Plant Pollution Control Systems

Air Pollution Control

1.239
In this section air pollution control systems and expected emission rates for each plant process unit are described. Several meetings between the applicant, the U. S. Environmental Protection Agency, and counterpart State agencies were held to examine steel process technology and to define emission standards under the following designations: Lowest Achievable Emission Rate (LAER) and Best Available Control Technology (BACT). The Lowest Achievable Emission Rate is derived from the most stingent emission limitation required by a given state in its implementation plan or the most stringent limitation which is achieved in practice. LAER requirements are generally based on the stricter of these limitations. Best Available Control Technology is an emission limitation based upon the maximum degree of reduction of each pollutant. In determining BACT limitations, due consideration is given to the impact on environment, energy, and economics. A tabulation of combined BACT and LAER limitations for the proposed mill as delivered to the applicant, revised as of 18 January 1978, is presented in Table 1-22. Additional information on BACT and LAER limitations is presented later in this chapter.

a) Raw Materials Handling System

Iron Ore, Pellets, and Limestone

1.240
The potential emission sources include unloading and stacking of ore, pellets, and limestone, in-pile storage, reclaim from storage piles, and transfer points for conveyor systems. Emissions associated with ore, pellet, and limestone unloading will be minimized through the use of self-unloaders or electric buckets, since disturbed air in the hold is contained below deck. Potential emissions from stacking and storage of the ore, pellets, and limestone will be controlled by wet spraying, in conformance with USEPA BACT emission limitations. The

Table 1-22

Revised 1/18/78

BACT/LAER Clarification Chart

Process	Emission Limitation	Designation
A. Materials Processing and Handling		
Storage Piles	Ore, Pellets, Coal, Limestone-Winterized Water Sprays using a surface bonding agent, adjustable stacker heights	BACT
	No visible fugitive emission greater than five percent opacity as measured by Method 9.	
	Limestone and dolomite fines Less than 1/4 inch 1. Three-sided shed or 2. Silo storage	BACT
Conveyors	No visible fugitive emission greater than two percent obacity from the conveyors/ enclosed	BACT
Transfer Points	Ore, Pellets, Coal No visible fugitive emission at transfer points. No visible fugitive emissions from the control device outlet, if applicable. Use of water sprays or enclosure exhausted to a baghouse mandatory.	BACT
Storage Bins and Silos	Enclosed unloading bins with no visible fugitive emissions greater than two percent. Bin vented to baghouse with no visible emission from the control device nor emissions greater than 0.01 GR/SCFD.	BACT

Table 1-22 (Cont'd)

Process	Emission Limitations	Designation
Larry Car Purge	0.02 GR/SCFD Filterable	LAER
Pushing	Enclosed pushing using the best available capture technology resulting in no emissions from the system equal to or greater than 20 percent opacity. The emissions from the gas cleaning device shall not exceed 0.03 lbs/ton coke.	LAER
Doors	There shall be no visible emissions from greater than five percent of the total number of coke doors and pusher side doors on the battery. All batteries must be retrofittable for door hoods in the event that greater than five percent of the doors leak. Door hood systems shall be capable of capturing emissions from all the leaking doors.	LAER
Lids	No visible emissions except from one percent of the lids. Ovens being decarbonized within 1/2 hour of the push shall be excluded from both the numerator and denominator of this determination.	LAER
Offtakes	No visible emissions except from four percent of the offtakes. Ovens being decarbonized within 1/2-hour of the push shall be excluded from both the numerator and denominator of this determination.	LAER
Combustion Stack	0.015 GR/SCFD	LAER

Table 1-22 (Cont'd)

	Process	Emission Limitation	Designation
	Roadways	Paving of all roads and water washing or vacuum cleaning.	BACT
	Coal Car Dumping and Bottom Unloading	Enclosure exhausted to baghouse or wet suppression of fugitive emissions resulting in no visible fugitive emissions greater than two percent opacity as measured by Method 9. There shall be no visible emissions nor particulate matter in excess of 0.01GR/SCFD from any baghouse installed pursuant to this requirement.	BACT
	Coal Blending and Mixing Area (Exclusive of Blending Material Storage Piles)	Enclosure exhausted to baghouse. with no visible fugitive emissions greater than two percent opacity as measured by Method 9. There shall be no fugitive visible emissions nor particulate matter in excess of 0.01 GR/SCFD from the baghouse exhaust.	BACT
B.	Crushers	Enclosure to Baghouse, with no visible fugitive emissions greater than two percent opacity as measured by Method 9. There shall be no visible emissions nor particulate matter in excess of 0.01 GR/SCFD from the baghouse exhaust.	BACT
	Screens	Enclosure to Baghouse or equipped with water sprays with no visible fugitive emissions greater than two percent opacity as measured by Method 9. There shall be no visible emissions nor particulate matter in excess of 0.01 GR/SCFD from the baghouse exhaust.	BACT

Table 1-22 (Cont'd)

Process	Emission Limitation	Designation
APC Collector Unloading & Dust Handling	A positive method of controlling dust generated during the unloading and transport; i.e., wetting, enclosure, pelletizing, screw conveyor, as appropriate such that there are no fugitive emissions greater than two percent opacity as measured by Method 9.	BACT
Truck or Rail Hauling	Covered load for all open bed transfer of cool material.	BACT
Truck and Rail Unloading and Landfilling	Enclosure exhausted to baghouse agglomeration, pelletizing, or wet suppression of fugitive emissions resulting in no visible emissions greater than two percent opacity as measured by Method 9. There shall be no visible emissions nor particulate matter in excess of 0.1 GR/SCFD from any baghouse installed pursuant to this requirement.	BACT
C. Coke Ovens		
Charging (Wet Coal)	There shall be no visible emissions during the charging of any five consecutive charges for greater than 55 seconds from the larry car, oven ports, or any of the jumper pipe/larry car to oven interface points. There shall be no visible emissions from either the offtake piping cap or oven doors.	LAER
Charging (Dry Coal)	Same as wet coal, install with retrofittability to wet coal charging methods. There shall be no visible emissions from either the offtake piping cap or oven doors.	LAER

Table 1-22 (Cont'd)

Process	Emission Limitation	Designation
Quenching	0.25 lbs/ton Coke. Dry coke quenching or its equivalent must be employed.	LAER
COG Desulfurization	35 GR H_2S/100 DSCF including organic sulfur and tail gas.	BACT
Chemical Storage Facilities (light oils, fuel oil gasoline)	For all fluids having a Reid vapor pressure $\geq$ 4 psi, storage must be in pressurized tanks with condensation systems.	LAER
Preheater	0.02 GR/SCFD (Filterable)	LAER
Gasoline, Fuel Oil Terminals	Vapor Recovery systems for all terminals and vehicle loading areas including trucks to storage and tank to vehicle operations.	LAER
D. Sinter Plant		
Windbox	0.02 GR/SCFD	LAER
Discharge (Breaker, Hot Screens, and Crash Deck)	Enclosure exhausted to baghouse, 0.01 GR/SCFD from the baghouse exhaust. No fugitive emissions from the enclosure.	BACT
Balling Drum	0.02 GR/SCFD from the gas cleaning device. No fugitive emissions.	BACT
Cooler	0.02 GR/SCFD from the gas cleaning.	BACT
Cold Screens	Enclosure exhausted to baghouse 0.01 GR/SCFD from the baghouse exhaust. No fugitive emissions.	BACT

Table 1-22 (Cont'd)

Process	Emission Limitation	Designation
E. Blast Furnaces		
Loading System and Vented Pressure Stream	Enclosed System/Baghouse 0.01 GR/SCFD	BACT
Blast Furnace	0.005 GR/SCFD, flare gas downstream of gas cleaning devices.	BACT
Cast House Iron and Slag Notch, Trough, Sprouts, and Skimmer	Complete evacuation or all points hooded w/exhaust to baghouse, 0.05 lb/ton.	BACT
Slag Cooling (Granulation)	Enclosure, 0.02 GR/SCFD 35 ppm H_2S	BACT/DER
F. Basic Oxygen Process (Bottom Blown)		
Main Exhaust Stack	Not to exceed 0.040 lb/ton nor 0.015 GR/SCFD including all gas from charge to tap.	BACT
Charging and Tapping	Building: No visible emission equal to or greater than 10 percent opacity from the roof monitor vessels: Complete enclosure of the furnace plus installation of a separate hood and gas cleaning system capable of capturing the charging, tapping, and other secondary emissions. 0.01 GR/SCFD from the gas cleaning device exhaust.	BACT
Steel Slag Cooling & Handling	Enclosure	BACT
Hot Metal Desulf and/or Deslagging and/or Dekishing	Hood exhausted to baghouse or Venturi. The outlet concentration from the control device may not exceed 0.02 GR/SCFD.	BACT

Table 1-22 (Cont'd)

Process	Emission Limitation	Designation
Vessel Turn Down	These should be minimized by taking heat samples and temperatures and making ore additions while in the vertical position. Secondary hood and gas cleaning system is to be operable and used during all turn-down operations, i.e., slagging and deskulling.	BACT
G. Continuous Casting		
Skimming	Hood exhausted to a Venturi scrubber @ 0.02 GR/SCFD.	BACT
Liquid Steel Charging to the Tundish	The steel transfer is to be either chemically or mechanically shrouded or equivalent. If a mechanical shroud or hood is used, it must be exhausted to a baghouse @ 0.01 GR/SCFD.	BACT
Slab Cutting	Fumeless Burners or Downdraft Hood to Baghouse	BACT
Slab Scarfing	Hood Exhausted to wet ESP @ 0.01 GR/SCFD	BACT
Spot Scarfing	Hood Exhausted to a wet ESP @ 0.01 GR/SCFD/	BACT
H. Lime Kiln Plant	Kiln with hooded burner and discharge ends exhausted to baghouse or equivalent. 0.02 GR/SCFD≤20 percent capacity.	BACT
Packed Bed Cooler	Hooded to a baghouse or equivalent 0.01 GR/SCFD, NVE from the baghouse.	BACT

Table 1-22 (Cont'd)

	Process	Emission Limitation	Designation
	Storage Bins & Transfer Points	Hooded to a baghouse or equivalent 0.01 GR/SCFD, NVE from the baghouse.	BACT
	Roller Mill	Hooded to a baghouse or equivalent 0.01 GR/SCFD, NVE from the baghouse	BACT
	Packed Bed Preheater	Hooded to baghouse or equivalent 0.01 GR/SCFD, NVE	BACT
I.	Fuel Burning		
	COG (1) TSP	0.005 GR/SCFD	BACT
	(2) SO2	Desulfurization at by-product plant to ≤ 35 grains H_2S/100CF	BACT
	BFG (TSP)	0.005 GR/SCFD	BACT
	BOP - Offgas (TSP)	0.015 GR/SCFD	BACT
	Natural Gas	0.01 GR/SCFD	BACT
	Coal (1) TSP	0.1 lb/MMBtu	BACT
	(2) SO2	(FGD may be mandatory under new regulations)	
	Oil (1) TSP	0.02 GR/SCFD	BACT
	(2) SO2	1/2MMBtu new regulations)	BACT
J.	Hot Strip Mill		
	Reheating Furnaces	NVE, 0.01 GR/SCFD	BACT

Table 1-22 (Cont'd)

Process	Emission Limitation	Designation
Plate Mill Reheating Furnaces	NVE, 0.01GR/SCFD	BACT
Hot Scarfing	No fugitive emission, 0.01 GR/SCFD from the gas cleaning device.	BACT
Spot Scarfing	0.01 GR/SCFD from the gas cleaning device.	BACT

In the above chart the abbreviation "NVE" means no visible emissions.

All emission rates include condensibles except where specified otherwise. The sampling methods and procedures given are referred to the following:

1. Sample and Velocity Traverses for Stationary Sources, EPA Method 1 (Federal Register, Vol. 42, No. 160 - Thursday, 18 August 1977).

2. Determination of Stack Gas Velocity and Volumetric Flow Rate, EPA Method 2 (Type - Pitot Tube); (Federal Register Vol. 42, No. 160 - Thursday, 18 August 1977).

3. Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight, EPA Method 3 (Federal Register, Vol. 42, No. 160 - Thursday, 18 August 1977).

4. Determination of Moisture Content in Stack Gases, EPA Method 4, (Federal Register, Vol. 42, No. 160 - Thursday, 18 August 1977).

5. Determination of Particulate Emissions from Stationary Sources, EPA Method 5, (Federal Register, Vol. 42, No. 160 - Thursday, 18 August 1977).

6. In addition to the analytical procedure found in EPA Method 5, the condensible materials found in the back-half (everything between and including the back-half of the filter holder to the third impinger) will be included in the test results. The following procedures apply only to the back-half of the sampling train. The referenced procedures were taken from the "Commonwealth of Pennsylvania, 1977, Air Quality and Noise

Table 1-22 (Cont'd)

Control Source Test Manual" (reference 6A), and the EPA Air Pollution Training Institute manual titled, "Source Sampling for Particulate Emissions," April, 1974 (reference 6B).

The following procedures are to be used:

1. Follow procedures 1-5, 7, 9, 10, 11, and 12 found in reference 6A.

2. Divide the filtrate from step 9 into equal portions.

3) a. Portion I - follow step 13 and 18 in reference 6A.

   b. Portion II

   (1) Follow procedures found in references 6A and 6B for "Container No. 3."

   (2) Follow step 13 and 18 in reference 6A on the remaining water extract.

4. Follow steps 14, 15, 16, and 17 found in reference 6A on the material obtained from step 7.

5. Where applicable, adjustments in total weight will be made to reflect the total amount of liquid found in step 10 of reference 6A.

For the purpose of determining compliance with the New Source Review Regulations, the organic extract procedure (3b) will be used.

Adjustments to total condensible materials will be made based on results found in step 18, reference 6A.

emission rates for the process involving ore off-loading conveyor belt to stacker, and stacking into the piles have been calculated to be 1.5 kilograms (3.3 lbs) per hour of fugitive emissions, based on the reported uncontrolled emission factor in the U.S. Environmental Protection Agency Manual entitled, "Compilation of Air Pollution Emission Factors (AP-42 Section 8.19 third edition, August, 1977), subjected to 90 percent reduction for the planned BACT limitation control practice, for the quantity of materials being handled. The ore storage pile will have wet spray total dust suppression on material in storage and underground reclaim during the warm weather season, so that fugitive emissions from the ore storage pile will be negligible. The pellets will have been hardened by induration or firing at high temperatures, so that fugitive emissions from the pellet handling system and storage pile will be negligible. Although limestone delivered to the designated storage area will consist of stone larger than 13 mm (1/2 in.) having a moisture content of 3-6 percent, a wet spray dust suppression system will be used to control fugitive dust emissions. The emissions from limestone (and dolomite) off-loading, conveyor belt to stacker and stacking into piles are estimated to be 0.7 kilogram (1.5 lbs) per hour.

1.241
All major conveyors carrying raw materials to the process operations will be enclosed in conformance with BACT limitations to minimize emissions during transit. The transfer points within the conveying system will be hooded and enclosed, so that emissions to the atmosphere will be minimized. All transfer towers will exhaust dust laden air through baghouses to filter particulates before exhausting air to the atmosphere. The exhaust flow rate at the ore transfer point is estimated at 300 NM^3 (11,200 scf) per minute and the controlled emissions will meet the BACT limitations emission rate of 24 mg/Nm^3 (0.01 gr/scf) which is estimated at 0.43 kilogram (0.95 lb) per hour. There will be three exhaust sources with the ore (ore transfer) conveyor system. One will be located in the vicinity of the ore storage area while the other two are located in the blast furnace stockhouses. The gas flow rates from these three sources identified above are estimated to be 300 Nm^3 (11,200 scf) per minute, 250 Nm_3 (9,300 scf) per minute, and 350 Nm^3 (13,000 scf) per minute, respectively. Emissions from the baghouses are estimated at 0.43 kilograms (0.95 lb) per hour, 0.36 kilogram (0.8 lb) per hour, and 0.5 kilogram (1.1 lb) per hour. The gas flow rate from the transfer points for conveying limestone and dolomite is estimated at 300 Nm^3 (11,200 scf) per minute. Since this source is located in the same transfer tower as the ore conveyor system the baghouse emissions do not differ from those presented above. The particulate emissions in the clean gas from materials handling correspond to a particulate concentration of 0.024 g/Nm^3 (0.01 gr/scf) downstream of the bag filter in accordance with the BACT limitations standard.

Coal

1.242
Emissions associated with coal handling process involve dumping coal from cars to dump hopper, blending and storage, and coal conveyance. The air pollution control measures for each of these sources is described below.

Dumping Coal From Cars to Dump Hopper

1.243
The emissions from this source will be controlled by dumping into an enclosure equipped with a wet spray total dust suppression system. Control of fugitive dust will meet the BACT limits designated by the U. S. Environmental Protection Agency. In freezing temperatures, the railway cars may be held in coal car thaw sheds for several hours and heated by radiant electric heaters to eliminate ice blockages that interfere with rapid dumping of the coal from the cars. No emissions are expected during this operation.

Blending and Storage

1.244
The emissions arising from coal stocking and blending will be controlled by wet spray in conformance with BACT limitations. Since the coal will be received wet and will be exposed to water again during dumping, emissions from stocking and blending are expected to be minimal. Additionally, the coal in storage will be controlled by a wet spray total suppression system in conformance with BACT limitations so that fugitive emissions from this source are also expected to be negligible.

Coal Conveying

1.245
The coal will be recovered from the blended piles by the stacker/reclaimer and transferred through enclosed conveyors to a crushing station. Transfer points will also be enclosed and, if evacuation is required, will exhaust through a baghouse. The emissions from this source are discussed in the section on coal crushing and mixing which appears later in this section. The conveyor belts and the bag filters will be operated approximately 6,000 hours per year.

b) Lime Plant

1.246
Activities in the lime plant which involve potential emissions include limestone conveying, screening, limestone preheating, conveyance to the lime grinding facility, lime grinding, and transfer to

storage. A description of the pollution control facilities for each emission source is presented below.

Limestone Conveying

1.247

The conveyors will be enclosed and the transfer points will be hooded. The gases from the hoods will be exhausted at a gas flow rate estimated at 200 Nm^3 (7,440 scf) per minute. The gases will be cleaned in a baghouse before exhausting to the atmosphere. The maximum particulate emissions from the baghouse are estimated at 0.288 kilogram (0.6 lb) per hour. The particulate concentration in the clean gas is 24 mg/Nm03 (0.01 gr/scf), in accordance with BACT for baghouse exhaust.

Screening

1.248

There is no exposure to the atmosphere in this step so that no emissions are anticipated.

Limestone Preheater

1.249

Each kiln will burn COG at a rate of 9,700 Nm^3/hr (6,000 scfm) equivalent to 42.7 x 10^9 calories (1.69 x 10^8 Btu) per hour. The air supply to the kiln consists of fresh air and secondary air from the lime cooler. The kiln exhaust gas is used to preheat the limestone in a preheater. The gas flow rate from each preheater (1 preheater per kiln) is 1,225 Nm)3 (45,600 scf) per minute. Estimated uncontrolled annual average emissions from each preheater are 330 kilograms (726 lbs) per hour of particulates, 15.4 kilograms (33.9 lbs) per hour of SO_2, 22.5 kilograms (49.5 lbs) per hour of CO, and 9.4 kilograms (20.7 lbs) per hour of NO_x. The particulate emissions will be controlled in a baghouse. The efficiency of particulate collection is expected to be 99 percent in conformance with BACT limitations so that the controlled emissions from each preheater are estimated at 3.3 kilograms (7.3 lbs) per hour of particulates.

Lime Conveying

1.250

The conveyors will be enclosed and the transfer points will be covered with hoods. The air from the hoods will be cleaned in bag filters before being released to the atmosphere. The same bag filters will be used to clean air collecting dust in the lime grinding and conveying system.

Lime Grinding and Conveying of Ground Lime

1.251
A stream of air elutriates lime particulates (less than 1,000 microns in size) from the roller grinding mill and conveys them to the lime storage bin. The air flow rate for the dust collection system and grinding and conveying into the storage bins is estimated to exhaust from the storage at 1,700 Nm^3 (63,300 scf) per minute. The uncontrolled emissions from the storage bins are estimated at 230 kilograms (506 lbs) per hour. Bag filters will be used to control particulate emissions and the efficiency of particulate collection is estimated to be 99 percent. Therefore, the controlled emissions will be decreased to an annual average of 2.3 kilograms (5.1 lbs) per hour, and corresponds to the BACT limitation particulate concentration in the cleaned gas of about 24 mg/Nm^3 (0.01 gr/scf).

c) Coke Plant

Raw Materials Preparation

1.252
Emissions associated with the transfer of coal from railcars to storage areas, blending of coals, and storage in piles has been described in the earlier section entitled "Raw Materials Handling." The description below deals with emissions which are associated with coal conveyance, crushing and mixing operations, coal preheating, hot coal charging, and coke oven charging, charging lids and standpipe caps, underfiring of coke ovens, leakage from coke oven doors, coke pushing, quenching, use of the coke wharf, and operation of the coke by-product and desulfurization plant. An underground reclaiming hopper will be provided to reclaim coal from storage piles. Mobile equipment such as front-end loaders and trucks will be used only in an emergency if the reclaiming machine is out-of-service. Raw coal will be reclaimed from the blending beds at a rate of 1,000 tonnes (1,100 tons) per hour and be passed over magnets that will remove tramp iron. The coal will then enter the primary screening station where coal smaller than 13 millimeters (0.5 in.) in diameter will pass through the screen and be conveyed to any of six 1,400-tonne (1,540-ton) raw coal blending bins. Coal pieces having a diameter greater than 13 mm (0.5 in.) will be transported from the primary screen to a coal breaker which will reduce the size to 13 mm or less. The coal will then be discharged onto a conveyor supplying the raw coal blending bins.

Coal Conveying

1.253
Closed conveyors will be used to transfer the coal and the transfer points will be covered with sheds or hoods. The gas collected

through hoods in the evacuated sheds will be cleaned together with gas exhausted from coal crushing and mixing through a baghouse prior to being released to the atmosphere. The resulting emissions are exhausted with air flow from the crusher/mixer. During emergency operations, oil and water added to the coal on the conveyor will tend to reduce conveyor emissions.

Crushing and Mixing Operations

1.254
Emissions from the coal crusher and mixer will be controlled by a baghouse. The total gas flow coming from the crusher, the mixer, and the transfer during the operation is estimated at 500 Nm^3 (18,600 dscf) per minute. Exhausted air from the baghouse is estimated at 0.7 kilograms (1.6 lbs) per hour, which is in conformance with BACT limitations.

Coal Preheating

1.255
Emissions from coal preheaters will consist of fine coal particulates and of the products of combustion of COG in the combustion chambers of the preheaters. There will be negligible loss due to volatility from the coal because coal preheating temperature will be about 50°C (120°F) below the temperature required to start the distillation of the coal. Potential sources of particulate emissions will be the cyclone vents and the hot coal conveyors (if the seals on the conveyors are not maintained). Wet electrostatic precipitators will be used to control the emissions from the coal preheater exhaust. Each of the four operating preheating units will exhaust approximately 540 Nm^3 (20,000 scf) per minute of gas to the precipitators. The precipitators will be designed to reduce the particulate loading of the gas to 0.048 g/Nm^3 (0.02 gr/scf) in conformance with LAER requirements. The gas coming out of the precipitator will go to a stack. The designed controlled emissions are estimated at 1.55 kilograms (3.4 lbs) per hour from each preheater. The wet electrostatic precipitators will also remove condensible hydro-carbons, residuals of which are included in the particulate emissions reported above. In conformance with BACT limitations, the coke oven gas (COG) will contain 0.85 g/NM^3 (0.35 gr/scf) of H_2S. Exit gases from each preheater stack amount will amount to 7.4 kilograms (16.3 lbs) per hour SO_2 subject to a decrease of 50 percent due to the wet ESP exhaust control systems. The preheater exhaust will contain some nitrogen oxides (NO_x) because of the existence of a higher temperature combustion zone in the preheaters. The NO_x emissions from each preheater are estimated at 4.5 kilograms (9.9 lbs) per hour.

Hot Coal Charging Bins

1.256

A 500-tonne (550-ton) hot coal charging bin will be located at the end of and above each of the four 42-oven battery blocks so that there will be four charging bins. These bins will be filled with hot coal from the coal preheating unit by a closed conveyor containing an inert gas blanket of nitrogen. There are two potential sources of emission. One source is the vents at the top of the bins that release the gas displaced by the filling of the bin. The second source is the gas displaced by the filling of the larry car hoppers. At the bottom of the charging bin outlets, telescopic sleeves seal to the top ring of the larry car hoppers, preventing emissions to the atmosphere during filling of the larry cars. To prevent combustion of the hot coal with the ambient air in the larry car hoppers, the hoppers are purged five minutes/cycle with nitrogen which is exhausted through the hot coal charge bins. Wet electrostatic precipitators will be used to collect the particulate emissions from charging of the larry cars. The gas exit flow rate is 700 Nm^3/min (25,000 scfm) for each bin. The recovered fine coal will be sent to the storage area for recycling. The controlled emissions are estimated at 09.51 kilograms (1.12 lbs) per hour, and correspond to an outlet particulate loading of 48 mg/Nm^3 (0.02 gr/scf), including the residual condensible hydrocarbons passing through the wet ESP's.

Charging of Coal Into the Coke Ovens

1.257

Telescopic coal discharge chutes will be used to seal the bottom of the coal hoppers into the charging hole casings reducing emissions to the atmosphere. Some fugitive emissions may occur at the end of the charging sequence because the hoppers are not covered. Staged charging will be used in filling the slot ovens. The two outside hoppers and two inside hoppers will be discharged and the lids replaced sequentially. The larry car will then proceed to the next slot oven to be charged. At the empty oven, the goosenecks and standpipes will be cleaned before the larry car returns to the charging bin for the next load of hot coal. Charging emissions will be controlled in accordance with LAER limitations. As soon as the larry car leaves a newly charged oven, the lids will be checked to insure that they are properly seated. Lids will then be sealed with a clay slurry. In addition, the standpipe caps will be sealed with clay slurry by the larry car operator when he returns to charge the next scheduled oven. Athough the charging emissions are significantly reduced, fugitive area emissions could still be expected from the transfer of coal into larry cars and from charging cover lids. The residual fugitive emissions from coal charging in each battery (total of four coke oven batteries) are estimated to be decreased to

5.10 kilograms (11.2 lbs) per hour for particulates, 0.07 kilogram (0.15 lb) per hour for SO_2, 2.05 kilograms (4.5 lbs) per hour for CO, 0.1 kilogram (0.22 lb) per hour for NO_x, and 8.6 kilograms (18.9 lbs) per hour for hydrocarbons. The staged charging method of emission control was described in the process description section. This system will be designed to limit visible emissions during charging to not more than 55 seconds of total visible emissions per five consecutive charges as described in the "Proposed Amendments to Title 25 Department of Environmental Resources of Pennsylvania Article III. Air Resources Chapter 121."

Gas and Smoke Leakage from Charging Lids and Standpipe Caps

1.258
Leakage from charging hole lids and standpipes consists primarily of raw COG and is generally caused by improper seating, distorted lids, or dirt on the sealing surfaces combined with a pressure in the oven higher than the atmospheric pressure. Plugged or partially plugged standpipes and/or goosenecks can increase the pressure in the coke oven and cause increased occurrence of leaks. In conformance with the USEPA LAER topside emission limitations, the number of leaks will be limited to one percent of the charging hold lids and four percent of the gas offtake piping of the coke ovens of a battery by properly cleaning the standpipes, goosenecks, lids, and seats of each oven prior to charging. Also damaged lids will be replaced promptly. In addition, all lids will be wet sealed with a clay slurry immediately after each oven is charged.

Underfiring of Coke Ovens (Battery Stacks)

1.259
During the early years of service life of a newly constructed coke oven battery the only air pollutants from the heating system are sulfur dioxide, carbon monoxide, and smoke which are emitted from the battery stacks. The sulfur dioxide comes from the oxidation of hydrogen sulfide in the COG during combustion and the carbon monoxide and smoke result from the reaction equilibrium of the fuel and air supply for efficient combustion. Oxygen analyzers will be used to continuously monitor the products of combustion to inform the operators whether or not the correct quantity of air is being used for complete combustion. As a coke battery ages with increasing service life, leakage into the flues of the raw COG volatilizing from the coal in the hot oven chambers can cause increased emissions of the COG constituents in the exhaust gas. The battery design will provide for future systems to control increased emissions from leakage due to aging. The fuel burned in each battery is estimated at 64,900 Nm^3 per hour (40,000 scfm) of blast furnace gas (BFG) and 1,700 Nm^3 hour (1,050 scfm) of coke oven gas (COG). The estimated

gas flow from each battery is 2,150 Nm^3 (80,000 scf) per minute. The estimated emissions of hydrocarbons in the flue gas are 3.3 kilograms (7.3 lbs.) per hour from each battery, carbon monoxide 18.2 kilograms (39.6 lbs.) per hour, and sulfur oxide emissions 2.7 kilograms (5.9 lbs.) per hour. Particulate emissions are estimated at 4.7 kilograms (10.3 lbs.) per hour, based on a particulate concentration in the flue gas meeting the LAER limitations of 0.036 g/Nm^3 (0.015 gr/scf). The high temperature in the combustion zone favors NO_x formation at an estimated rate of 64.1 kilograms (141 lbs) per hour from each battery.

Leakage from Coke Oven Doors

1.260
Each slot type coke oven is equipped with two removable refractory-lined doors which are used to seal the ends of the coking chamber from the atmosphere during the 12- to 14-hour coking cycle. The "pusher side" door is on the end of the oven where the pusher machine is located. The "coke side" door is on the end of the oven where the coke is discharged into the hot-coke car at the end of the coking cycle. Self-sealing doors which use metal-to-metal contact between the door-sealing edge and the cast iron jamb will be used. The sealing edge will be backed by spring-loaded plungers, properly spaced, which will contour the door-sealing edge to the jamb. Coke oven door research work now in progress at the U. S. Steel Corporation Clairton Works indicates that doors can be designed which will meet the requirements of the EPA LAER limitation that no more than five percent of the doors may exhibit visible emissions during any one inspection. The pusher side doors will be equipped with "chuck doors" for emergency use in the unusual event that an oven is overcharged with hot coal or that wet coal is charged to the battery. Any coal pulled from this door will be dropped into a hopper on the pusher machine and recycled back to the oven charging system. Four spare pusher side and four spare coke side doors will be provided for each 42-oven battery.

Pushing of Coke from the Ovens

1.261
During pushing, emissions originate from four sources: (1) abrasion of the coke against the oven wall and coke guide as it is pushed, (2) breakage of the coke due to impact and thermal stresses as it falls into the hot-coke car, (3) volatilization of residues in the coke, and (4) imcomplete combustion of these volatiles. The first two sources result primarily in particulate emissions, while the latter two result in particulates, organic fumes, and gaseous pollutants. The quantity of emissions is exceedingly variable, primarily due to variation in the amount of volatiles in the coke (i.e., greenness or

high residual volatility). All coke may have some greenness, although only poor operation and maintenance results in much larger quantities of smoke. Normal operations require that coal be coked until there is about one percent volatiles left at the center of the coke mass. Observations of pushing from ovens charged with preheated coal indicate that pushing emissions are less than those from an oven with wet coal. (1-5) This is expected because the absence of water in the coal charge should result in more uniform heating of the coal mass in the oven. At the proposed plant, coal will be preheated prior to charging. Pushing emissions will also be minimized because the coke battery has a heating system that can provide good vertical and transverse temperature distribution in the heating walls. This will minimize residual green coke. Operating and maintenance procedures will be established to ensure that proper combustion is maintained in the heating flues on a continuing basis. The hot car pushing emission control system will have a moveable hood which completely covers the single spot quench car and captures the emissions during the push. The coke guide will be enclosed with a telescoping extension that extends down to the top of the hot coke car prior to the start of pushing. The gaseous and particulate emissions captured by the hood will be withdrawn through a fixed duct on the battery to a scrubber. After pushing, the hot coke car will be sent to the quench tower. The car will then proceed to the coke wharf and side gates will be opened for discharge of the coke to the wharf. The gas flow rate to each scrubber is 2,400 Nm^3 (84,800 scf) per minute, so the total uncontrolled emissions from coke pushing are expected to be 2.8 kilograms (6.2 lbs) per hour of particulates, 0.48 kilograms (1.1 lbs) per hour of CO, and 1.4 kilograms (3.1 lbs) per hour of hydrocarbons from each coke oven. These emissions are of short duration (several minutes) and occur only during the pushing operation. A total of 288 ovens will be pushed per day.

Coke Quenching System

1.262
The quench emissions depend on the level of suspended solids present in the quench water. Approximately 600 gallons of water per coke ton will be utilized during the quenching operation. Water used in this process will be continuously recycled through a water treatment plant. The quenching operation lasts 1.5 minutes for each 32 tonne (35 ton) car load of coke. Gas flow rates associated with quenching operation are estimated to be 413 Nm^3 (5,400 scf) per minute, and will contain particulates limited to a LAER emission rate equivalent to 0.114 kilogram (0.25 lb) per ton of coke. There will be two quench stations, one for each pair of coke batteries and each quench tower will be equipped with a particulate control system containing baffles. Controlled emissions are estimated at 23.2 kilograms (51 lbs) per hour of quench tower operation.

Coke Wharf

1.263
The emission control will include enclosed conveyor with collection and cleaning of gas at all transfer points. The air flow rate is estimated at 100 Nm^3 (3,700 scf) per minute. The exhausted air will be cleaned in a baghouse, and the resulting controlled emissions are estimated at 0.15 kilogram (0.33 lb) pr hour. Coke crushers will be evacuated with an airflow rate of 450 Nm^3 (17,000 scf) per minute. The outlet particulate concentration is equal to 0.024 g/Nm^3 (0.01 gr/scf), as at the transfer tower, for an emission rate of 0.7 kilogram (1.5 lbs) per hour. Coke dust collected during this process will either be sent back to the coke oven charging bins or to the sinter plant.

Chemical Byproduct Plant and Desulfurization Plant

1.264
The sulfur compounds in the emissions from the sulfur recovery plant plus the H_2S in the clean COG will be reduced to 0.85 g/Nm^3 (0.35 gr/scf) H_2S equivalent in the clean gas. In the storage areas, all hydrocarbon storage tanks will be equipped with vapor emission control devices or pressurized tanks with condensation systems in accordance with the LAER emission limitations, and in relation to the vapor pressure exerted by the stored liquid. For light oil storage, floating roof tanks will be used while tar tanks will be equipped with vent scrubbers to prevent emissions. Anhydrous ammonia will be stored in pressurized or refrigerated tanks.

d) Sinter Plant

1.265
All conveyor systems for all material transfers will be enclosed. Dust that becomes airborne at the top or bottom of storage bins, at the feed or discharge end of the sinter machine, at the cooler, from sinter-handling, and at the sinter crushing and screening area will be collected by hoods. The dust collected by the hoods will be exhausted to baghouses. The gas collected in the hoods installed over the transfer points for sinter plant feed will be cleaned separately. The air flows at the transfer towers are estimated at 250 and 300 Nm^3 (9,300 scf and 13,000 scf) per minute. Bag filters will have particulate collection efficiency resulting in controlled emissions estimated at 0.36 kilograms (0.81 lbs) and 0.50 kilograms (1.1 lbs) per hour, respectively. The particulate concentration in the clean gas is based on 0.024 g/Nm^3 (0.01 gr/scf), in conformance with BACT. The gas flow rate for screening at the sinter plant is estimated at 10,000 Nm^3 (372,000 scf) per minute. Bag filters will

be used to remove particulates from the gas stream and the controlled particulate emissions are estimated at 14.4 kilograms (31.7 lbs. per hour. Particulate loading in the clean gas is limited to 0.024 g/Nm^3 (0.01 gr/scf). Other emissions present in the sinter plant include emissions from transfer of sinter product and fugitive area emissions. For this activity, fugitive particulate emissions are estimated at 13.7 kilograms (30.1 lbs) per hour. The exhaust gas from the sintering process will be gathered in a collector and treated to remove dust and other materials before being exhausted to the atmosphere. The gas stream will be split to two collector mains because of the size of the sinter machine and the large volume of the waste gas stream: 23,560 Nm^3 (877,000 scf) per minute. The gas handling and cleaning equipment will consist of cyclones, fans, and wet electrostatic precipitators. The emissions are estimated at 240 kilograms (528 lbs) per hour of SO_2, 10,600 kilograms (23,320) per hour of CO, 243 kilograms (535 lbs) per hour of NO_x, and 22.6 kilograms (49.7 lbs) per hour of hydrocarbons. The particulate emissions will be reduced to 68.3 kilograms (150.2 lbs) per hour, based on particulate concentration in the clean gas of 0.048 g/Nm^3 (0.02 gr/scf). Hydrocarbon emissions will be limited to 22.6 kilograms (49.7 lbs) per hour, based on 95 percent removal by condensation and capture through the wet electrostatic precipitator.

e) Blast Furnace

1.266
Emission sources associated with the blast furnace include stockhouse operation, top gas cleaning, use of the blast furnace gas flare stack, operation of the casthouse, stove exhaust, furnace area activities, pig iron granulation, and hot metal desulfurization. A brief description of the emission control system associated with blast furnace operation is presented below.

Stockhouse

1.267
The top of the bins in the stockhouse will have a wet spray dust suppression system. As this system has provided satisfactory control in the past, there will be no need for hooding or an exhaust system. At the bottom of the bins, a proprietary dust suppression system will be used on the vibrating feeders and collecting belts. There will be no hood or exhaust system under the bins. The vibrating screens and weigh hoppers will be hooded and provided with a dust collection system consisting of ducts and fans exhausting to a baghouse. The gas flow rate to the baghouse is 500 Nm^3 (18,600 scf) per minute from each of the two systems for two blast furnaces. Dust from the baghouse will be mixed with water and returned to the metallic charge fines belt for return to the sinter plant. The controlled emissions

from each of the two baghouses are estimated at 0.7 kilograms (1.5 lbs) per hour, based on the particulate concentration in the clean gas of 24 mg/Nm^3 (0.01 gr/scf), in conformance with BACT.

Blast Furnace Top Gas Cleaning

1.268
The top gas from the furnace, approximately, 10,400 Nm^3 (387,000 scf) per minute from each furnace, will first be cleaned in a dust catcher where large particles of dust will be removed. The gas will then be cleaned in two venturi scrubbers operating in series. The particulate concentration in the gas after cleaning will be less than 12 mg/Nm^3 (0.005 gr/scf) as required by the BACT limitations for BFG. The cleaned gas will then be distributed through the plant as clean fuel gas. The top gas will not be exhausted to the atmosphere except from the flare stack.

Blast Furnace Gas Flare Stack

1.269
There will be a BFG flare stack to burn excess gas in case emergency conditions at the power plant boiler house prevent its use within the facility. The amount of gas to be flared will be held to an absolute minimum in order to conserve energy. It is estimated that each bleeder will be open less than 1 percent of the time. The BFG system will have a gas holder which can handle short upsets or changes in demand. Therefore the quantity of gas flared to the atmosphere will be minimized. When the flare tack is opened, the instantaneous gas flow could be as high as 5,000 Nm^3/min (186,100 scfm). On the average (with 1/2 percent of the top gas being flared), the rate would be about 50 Nm^3 (1,900 scf) per hour from either of these two flare stacks. Particulate emissions to the atmosphere will be 0.04 kilogram (0.09 lb) per hour annual average rate. Although the gas would be burned, very little NO_x would be formed because of the low flame temperature. Estimated emissions from each flare stack, in addition to the particulate emissions, will include 0.9 kilogram (2.0 lbs) per hour of CO, 3.0 kilograms (6.6 lbs) per hour of NO_x, and 0.15 kilogram (0.3 lb) per hour of hydrocarbons.

Cast House

1.270
Fumes and dust will be generated during the casting operation in the case of the blast furnace. In past practice, no cast house emission controls were installed on blast furnaces because natural convection currents in the cast house carried any fumes that were generated to the top of the cast house where they were exhausted through the roof by ventilators. In new modern very large blast furnaces, such as

those planned for the proposed plant, some form of emission control will be necessary. The large furnaces operate at two or three times atmospheric pressure and are cast almost continuously. Normally, each furnace will be cast 12 times a day and each cast will last approximately two hours. For the new furnaces at this plant, a cast house fume emission system will be installed on each furnace. This system will evacuate the gas and fumes at three specific locations for each tap hole. There will be a hood at the tap hole, a removable cover over the iron trough and a removable cover over the skimmer and dam. Fumes which escape from the covers will be exhausted from this area during the cast. There will also be a fume removal hood over the tilting spout location. All other runners in the cast house will be covered. The fumes collected by this system will be cleaned in a baghouse adjacent to the cast house. There will be one baghouse per blast furnace (total to 3 baghouses) and each will have a capacity of approximately 20,000 Nm^3 (744,000 scf) per minute. Cleaning efficiency will be at least 99 percent, but it is estimated that this system will control only about 95 percent of the fumes generated in the cast house. The reason that the system cannot remove more of the fumes is that the opening and closing of the tap hole will occur only 10 percent of the time. During this time, a part of the cover over the iron trough must be removed to permit the tap hole drill and mud gun to be used, so that emission from a short length of the total trough would be uncaptured. The uncontrolled emissions factor at the cast house is 0.5 lb/ton of hot metal and the controlled emissions are estimated at 0.88 kilograms (1.94 lbs) per hour. The fugitive emissions uncaptured by the collection system are estimated at 4.0 kilograms (12.2 lbs) per hour, based on the preceding consideration, for each blast furnace, subject to a settling rate of 50 percent within the cast house building.

Stove Exhaust Stack

1.271
The blast air will be delivered by blowers from the powerhouse. Four stoves will be provided for each furnace to heat the blast air to the range of 1,000° (1,832°F) to 1,250°C (2,282°F) for blowing through the tuyeres into the furnace. Approximately 167,700 NM^3/hr (104,000 scfm) of BFG and 23,200 Nm^3/hr (14,400 scfm) of COG will be burned per blast furnace. The resulting emissions are estimated at 2.3 kilograms (5.1 lbs) per hour of particulates, 36.9 kilograms (81.2 lbs) per hour of SO_2, 52.1 kilograms (114.5 lbs) per hour of CO, 184 kilograms (405 lbs) per hour of NO_x, and 9.2 kilograms (20.2 lbs) per hour of hydrocarbons.

Blast Furnace Emissions

1.272
The cast house emissions from the blast furnace area will be controlled in the proprietary system described above with the control efficiency estimated at 95 percent. The resulting uncaptured or fugitive emissions from the blast furnace area are estimated at 9.3 kilograms (20.5 lbs) per hour, from both furnaces together.

Pig Iron Granulation

1.273
The pig iron granulation facility will be installed on a standby condition for use only in an emergency basis, but some fume control will be necessary. The pouring location where the hot metal will be poured from the transfer ladles will be hooded and the fumes exhausted into a small baghouse having 99 percent collection efficiency. The controlled emissions based on the particulate concentration of 0.024 g/Nm^3 (0.01 gr/dscf) and a gas flow rate of 1,000 Nm^3 (37,200 scf/min) are estimated at 1.4 kilograms (3.2 lbs) per hour during use. However, the expected frequency of occurrence of this activity is less than one percent of the blast furnace ladles or less than once per day.

Hot Metal Desulfurization

1.274
At the hot metal desulfurization station located in the hot metal charging aisle, an emission control system will be installed to remove the fumes generated during the desulfurizing step. A hood will cover the top of the ladle and capture the fumes generated when the lance injects the calcium carbide mixture. One desulfurization station will serve both blast furnaces. The fumes generated from the desulfurization operation will be cleaned in a baghouse of about 1,000 Nm^3 (37,200 scf) per minute capacity. Particulate concentration in the cleaned gas will be in conformance with the BACT emission limitation of 48 mg/Nm (0.020 gr/scf) so that the dust loading will be no more than 2.9 kilograms (6.4 lbs) per hour.

f) Steelmaking Operations

1.275
Emissions associated with certain operations related to steelmaking are subject to BACT limitations. These include hot metal skimming, hot metal mixing, basic oxygen furnace operation. Emission control facilities associated with the steelmaking process are described below.

Scrap Preparation

1.276
The scrap operation consists of handling and segregating cut-to-size metal values from in-plant operations and distributing them to the blast furnaces or Q-BOP steelmaking furnaces, as appropriate. No emissions are generated by this activity.

Hot Metal Skimming

1.277
The hot metal will be picked up from the desulfurizing transfer car by a crane and will be carried to the slag skimming station in the transfer aisle. A slag skimming machine will skim the slag from the ladle into a slag pot. Following skimming, the ladle crane will carry the ladle to a hot metal mixer or to a hot metal car for transfer into the parallel charging aisle to go directly to the Q-BOP steelmaking furnaces. The fumes generated by the skimming operation will be collected in a hood and directed to the hot metal mixer bag filter for cleaning.

Hot Metal Mixer

1.278
Following skimming, the ladle will be transferred via the north north transfer aisle to one of the three 2,500-tonne (2,750 ton) hot metal mixers. The contents of the ladle will then be poured into the mixer. After mixing, the hot metal will be poured out of the mixer into the ladle and carried to the Q-BOP furnace area. A collector hood will be installed over the mixer. The air will be exhausted through a baghouse with a flow rate estimated at 700 Nm^3 (26,000 scf) per minute during pouring and tapping (about 25 percent of the time). The estimated capture efficiency will be higher than 99+ percent. The controlled emissions are estimated at 4.9 kilograms (10.8 lbs) per hour. These emission rates correspond to particulate concentration of 48 mg/Nm^3 (0.02 gr/dscf) in the clean gas which is in conformance with BACT limitations.

Q-BOP

1.279
The steelmaking shop will contain three 300-tonne (330-ton) capacity Q-BOP furnaces, two of which will be operated at all times. In the steelmaking operations, emissions are generated during charging hot metal into the Q-BOP furnace, steelmaking, and tapping operations. In addition, some uncaptured emissions are present from the steelmaking area. Emissions from charging, steelmaking, and tapping are collected in the hoods. For control of the charging operation, a

secondary collector hood over the charging door will be installed as the direct control system and will collect 98 percent or most of the charging emissions. The remainder will be dispersed into the building and partially exhausted through the roof monitors. Similarly, for tapping operations, the primary hood over the furnace will be the direct hood and will collect 98 percent or most of the tapping emissions. The remaining emissions will be dispersed into the building where they will be subjected to an estimated settling rate of 50 percent before being exhausted through the roof monitors to atmosphere. Emissions during steelmaking operations will be totally collected in the close coupled primary hood over the furnace which will be entirely enclosed. Baghouses will be used to extract emissions captured in the secondary hoods over the charging doors, and high energy scrubbers will be used to extract emissions captured in the primary hoods. During steelmaking, the gas flow rate from each furnace is estimated at 3,500 Nm^3 (130,000 scf) per minute. The exhaust gas from the furnace will be collected and cooled in a membrane-type hood and directed to venturi scrubber. A suppressed combustion system will be used which is designed to limit the loss of CO by combustion to a maximum of 15 percent. At the bottom of the hood, there will be an adjustable skirt which will be lowered to restrict the entrance of the combustion air. The waste gases from oxygen blowing during steelmaking are exhausted about half of the blowing period or 20 percent of the cycle time. The annual average controlled emissions from each scrubber during operation are estimated at 1.0 kilogram (2.2 lbs) per hour. The resulting controlled emission factor is based on the particulate concentration of 36 mg/Nm^3 (0.015 gr/scf) in the clean gas, in conformance with the BACT emission limitation. During the other half of the blowing period or approximately 20 percent of the cycle time, the steelmaking off-gas has sufficient fuel value to support combustion so that it is sent to the powerhouse. The uncontrolled emissions during charging operations are estimated from the emission factor of 0.5 lb/ton of hot metal as the residual from 98 percent captured by the secondary or direct hood for the charging operation at each furnace. The gas flow rate for the secondary hood is to be designed at 25,000 Nm^3 (930,000 scf) per minute for each of the two systems to control the charging emissions from on-line Q-BOP furnaces. The uncontrolled emissions from tapping are estimated from the emission factor of 0.3 lb/ton of molten steel tapped and teemed as the residual of 98 percent captured by the primary or direct hood over the furnace for the tapping operation at each furnace. The primary exhaust system has an air flow rate of 3,500 Nm^3 (130,000 scf) per minute through a high energy scrubber. The resulting uncaptured emissions amount to 6.0 kilograms (13.2 lbs) per hour or two percent of the uncontrolled emissions during charging and tapping, subject to a settling rate of 50 percent within the Q-BOP building.

g) Continuous Casting

1.280
Emissions associated with the continuous casting process occur during argon stirring, trimming, and casting; teeming of the ladle into the tundish and the tundish into molds at each machine, tundish preheating and dumping and cleaning; operations of spray chambers, use of primary cut off torches; spot scarfing; and machine scarfing.

Argon Stirring, Trimming, and Casting

1.281
Argon stirring of molten steel tapped from the BOP vessel will be provided to homogenize temperature, chemistry and assist floatation of non-metallics. In addition, certain gases are removed, such as nitrogen, hydrogen, and carbon monoxide. Quantities of gases removed are small due to limited stirring requirements. Emissions from the argon stirring are estimated at less than 0.1 kilogram (0.2 lb) per hour based on the emission factor of less than 100 milligrams/tonne (0.2 x 10^{-3} lb per ton) calculated from molten iron vapor pressure and the argon flow rate. The emissions will last a maximum of 10 percent of the cycle time for stirring. Each station will be operated on an average 2,000 hours per year, or about 25 percent of the time during the operations. Emissions will be subjected to a settling rate of 50 percent within the casting building before being exhausted through roof monitors.

Teeming of Ladle into Tundish and Tundish to Molds at Each Machine

1.282
For continuous casting, the melt shop ladle will be delivered to the slab casters and positioned over the tundish with the tundish located over the molds. The cast will be made by pouring molten steel into the tundish for distribution to two molds and during this operation fumes will be generated. Ladle-to-tundish and tundish-to-mold shrouding will be used for oxidation prevention and to minimize escape of emissions. The ladle-to-tundish and tundish-to-mold molten steel streams will be shrouded with either refractory ceramic or inert gas, in conformance with BACT limitations. Insulating flux or powder will cover the liquid level in the tundish and both molds to minimize fume emissions from the molten metal surfaces. As a result of these control practices, the emission factor for molten steel of 0.15 kilogram per/tonne (0.3 lb/ton)* is expected to be decreased by

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* EPA-450/3-77-010, Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions (March 1977), Pedco Report.

Tundish Preheat Stations

50 percent for potential surface exposure to air and subjected to a decrease of 90 percent to 0.0075 kilogram per/tonne (0.015 lb/ton) because of the shrouding and molten surface control practice. The resulting fugitive emissions will be 5.8 kilograms (12.8 lbs) per hour of particulates from ladle, tundish, and mold liquid levels, which constitute less than half of the usual molten steel exposure to atmosphere during tapping and teeming. These fugitive emissions also will be subject to a settling rate of 50 percent within the casting building before being exhausted through the roof monitors.

Tundish Preheat Stations

1.283
The tundish preheat stations, located on the casting floor are required to provide a 1,200°C (2,192°F) refractory temperature for processing liquid steel. Coke oven gas (COG) will be used for heating and controls for the tundish cover burners will be located on both sides of each of the six casting machines. Gaseous emissions from tundish preheating will not be controlled. Burned and unburned gases will rise, dilute, and exit through the roof monitors. In addition, heat is required for other operations in this area. Total fuel energy consumed is estimated at equivalent to 122.6 x 10^6 kcal (486 x 10^6 Btu) per hour. The maximum COG flow rate is estimated at 32,300 Nm^3 (1,206,000 scf) per minute. Estimated emissions from this combustion source are 44.3 kilograms (97.5 lbs) per hour of SO_2, 16.7 kilograms (36.7 lbs) per hour of CO, 26.8 kilograms (59 lbs) per hour of NO_x, 1.4 kilograms (3.1 lbs) per hour of hydrocarbons, and 0.33 kilogram (0.73 lbs) per hour of particulates. The rate of particulate emissions will also be subject to the building settling effect of 50 percent and the balance is treated as part of the continuous casting building fugitives.

Tundish Dumping and Cleaning Stations

1.284
Dumping and cleaning stations will be provided on each side of the casting machine. Stations will be provided with hoods and exhaust systems to caputre emissions when solidified steel and slag are dumped from the tundish at the conclusion of its refractory service life. Some heats will require oxygen lancing of the tundish, which is expected to occur two hours per day. Exhaust from oxygen lancing of tundishes, producing particulate emissions at an uncontrolled rate of 160 kilograms (352 lbs) per hour when three tundishes are being cleaned simultaneously, will be captured by collector hooding and sent to a gas cleaning system with a baghouse. The capacity of this system will be 2,600 Nm^3 (96,800 scf) per minute and it will operate at about 98 percent efficiency. Particulate emissions in the cleaned gas are estimated to average 0.63 kilogram (1.4 lbs) per hour

for daily operations, based on the BACT particulate concentration in the clean gas of 40 mg/Nm^3 (0.02 gr/scf). The tundish dumping and cleaning is done three times a day and lasts only a few minutes each time; therefore, emissions from this source are small.

Spray Chamber Exhaust

1.285
Spray chambers will be provided for each machine which will exhaust secondary spray water steam to the atmosphere. Ten percent of the product spray water will be converted to steam or 750 kilograms (1,650 lbs) per minute per strand. Exhaust fan capacity for each strand, each strand being totally enclosed, is 2,600 Nm^3/min or 5,200 Nm^3 (194,000 scf) per minute per machine. A single 2.5 meter (97.5-in.) diameter stack will be provided for each machine and result in about 18 meters (60 ft) per second stack velocity. Operation experience indicates that the stream generated when water is sprayed on the cast steel surface is essentially free of particulate pollutants.

Primary Cut-Off Torches

1.286
A primary traveling cut-off torch machine will be provided for each strand to cut slabs to proper length. Slab lengths will be 12 meters (39.4 ft) for the hot strip mill, and from 3.6 meters (11.8 ft) for the plate mill, which will require separate primary cutting machines. Particulate emissions for primary cutting will be minimized through the use of fumeless burners.

Mechanized Spot Scarfing

1.287
Spot scarfing of slabs will be accomplished by two mechanized scarfing machines located over a transfer bed with a slab turnover mechanism. Each machine will spot scarf one broad face and one narrow face as the slab is processed across the transfer bed. The capacity of this proposed system is 300 tonnes (330 tons) per hour. Only 10 percent surface removal will be required for 35 percent of the slabs. The particulate emission rate for all machines is 52 kilograms (114 lbs) per hour. Control will be provided by a baghouse equipped with fabric filters and operating at a projected efficiency of eight percent. The gas flow rate to the baghouse is estimated at 1,080 Nm^3 (40,200 scf) per minute. The controlled emission are estimated at 1.43 kilograms (3.1 lbs) per hour equal to 0.024 g/Nm^3 (0.01 gr/scf) in the clean gas, in accordance with BACT emission limitations.

Machine Scarfing

1.288
A machine scarfing system will be provided utilizing two-sided scarfers with a slab turnover. The proposed capacity is 900 tonnes (990 tons) per hour, which is equivalent to thirty-six 23-tonne (25.3-ton) slabs per hour. Fifteen percent of all cast slabs are expected to be machine scarfed. Each two-sided scarfer will generate 66 kilograms (145 lbs) per hour of uncontrolled particulate emissions (132 kilograms for both scarfing units). The emissions will be controlled in wet electrostatic precipitators having an efficiency of at least 98 percent. The gas flow rate from the electrostatic precipitator is estimated at 2,400 Nm^3 (89,300 scf) per minute. The particulate concentration in the clean gas is equal to 24 mg/Nm^3 (0.01 gr/scf), in conformance with the BACT emission limitation or a controlled emission rate of 1.0 kilogram (2.2 lb) per hour.

h) Rolling Mills

1.289
Three walking beam reheating furnaces will be installed to heat slabs for the hot strip mill. Coke oven and blast furnace gas, COG and BFG, will be burned at a rate of 7,900 Nm^3/hr (4,900 scfm) and 10,200 Nm^3/hr (6,300 scfm), respectively. Oil will be used as a standby fuel at an estimated average rate of 2,800 kilograms (6,200 lbs) per hour. The average emissions from each furnace are estimated at 5.6 kilograms (12.3 lbs) per hour of particulates, 80.2 kilograms (176.4 lbs) per hour of SO_2, 6.3 kilograms (13.9 lbs) per hour of CO, 38.1 kilograms (83.8 lbs) per hour of NO_x, and 1.5 kilograms (3.3 lbs) per hour of hydrocarbons. These emissions are exhausted through stacks. There will be two slab reheat furnaces for the plate mill. The estimate consumption of fuels include 4,000 Nm^3/hr (2,500 scfm) of BFG, 5,200 Nm^3/hr (3,200 age emissions from each furnace are 7.5 kilograms (16.5 lbs) per hour of particulates, 97.0 kilograms (213 lbs) per hour of SO, 4.5 kilograms 1.9 kilograms (4.2 lbs) per hour of hydrocarbons. These emissions, will be exhausted through stacks. COG will be used as the fuel source for plate normalizing furnace operation. Based on 150 tonnes (165 tons) per hour of normalized product, the furnace will require 1,100 Nm^3/hr (580 cfm) of COG. The average emissions from this source are estimated at 1.8 kilograms (4.0 lbs) per hour of SO_2, 0.3 kilogram (0.7 lb) per hour of CO, 1.1 kilograms (2.4 lbs) per hour of NO_x, 0.05 kilograms (0.11 lbs) per hour of hydrocarbons, and 0.01 kilograms (0.02 lbs) per hour of particulates. These emissions will be exhausted through a stack.

i) Other Supporting Operations

Boilers

1.290
Four onsite boilers and one spare boiler on stand-by will be used to generate steam. Each boiler will consume on an average 124,400 Nm^3/hr (77,000 scfm) of blast furnace gas, 9,100 Nm^3 (5,600 scfm) of basic oxygen process gas (BOP) gas, and 5.74 tonnes (6.31 tons) per hour of coal. Total heat input to the boiler is 155.5×10^6 Kcal (6.2×10^8Btu) per hour. Estimated average uncontrolled emissions from each boiler will be 9.3 kilograms (20.5 lbs) per hour of particulates, 89.8 kilograms (198 lbs) per hour of SO_2, 35.4 kilograms (77.9 lbs) per hour of CO, 21.3 kilograms (47 lbs) per hour of NO_x, and 7.3 kilograms (16.0 lbs) per hour of hydrocarbons. Electrostatic precipitators will be used to control particualte emissions in accordance with the new source and BACT performance limitation of 0.1 lb per million Btu for coal. The SO_2 emissions will be controlled at the new source and BACT performance limitation of 1.2 lbs per million Btu for coal firing by limiting the sulfur concentration in this boiler fuel to acceptable low levels of sulfur or by operation of a suitable flue gas desulfurization (FGD) system.

Slag Processing

1.291
Individual process operations for slag production will be enclosed to facilitate collection of emissions using a baghouse. The on line gas flow rate from this source is estimated at 500 Nm^3 (19,000 scf) per minute so that the controlled emissions are estimated at 0.7 kilogram (1.6 lbs per hour, in conformance with the BACT emission limitation of 24 mg/Nm^3 (0.01 gr/scf). In addition to the above emission, fugitive emissions from this source from slag storage piles will be controlled by a wet spray total dust suppression system.

Solid Waste Disposal

1.292
The solid waste management system for this facility has been designed to control and prevent the occurrence of fugitive emissions to atmosphere.

Plant Railroad System

1.293
The railway system associated with the proposed plant and project essentially involves two separate operations, hauling coal in and taking steel out. Incoming coal deliveries are expected to require

an average of two unit trains per day, and outgoing shipments of steel strip and plate are assumed to require 12 to 15 trains per day. In addition, slag traffic results in daily average fuel consumption, including onsite movement and idling time, of 110 gallons for coal hauling about 825 gallons for steel hauling (assuming yard engine fuel consumption will be less efficient than for the unit coal trains) and 165 gallons for the slag hauling. This daily average fuel consumption of 1,100 gallons with an emission factor of 0.025 pound per gallon is equivalent to the plant fugitive particulate emission rate of 0.5 kilogram (1.1 lbs) per hour which allocated to the appropriate plant operation areas, becomes less than 0.1 kilogram (0.22 lb) per hour per square kilometer of plant.

Plant Road System

1.294
The in-plant road system is only intended to accommodate vehicles directly involved with plant activities. In-plant mileage is estimated to be on the order of one million miles per year or about 3,000 miles per day. These vehicles will primarily be of the heavy duty type and will have an emission factor of 1.2 gm/mile of travel for a daily rate of 3.6 kilograms (7.9 lbs) and an hourly rate of 0.15 kilogram (0.33 lb). In addition to the travel time emissions, the emission factor of 1.2 gm/mile of travel for a daily rate of 3.6 kilograms (7.9 lbs) and an hourly rate of 0.15 kilogram (0.33 lb). In addition to the travel time emissions, the in-plant vehicles are expected to have emissions from fuel used while idling to be twice the emission from travel. Thus, the in-plant area emissions from trucks become 0.45 kilogram (1.0 lb) per hour, which have been allocated to the appropriate plant operating areas, and results in an area emission of less than 0.1 kilogram (0.22 lb) per hour per square kilometer.

Plant Emissions Inventory

1.295
Emission rates for individual process units within the proposed facillity have been prepared by the applicant. Estimates developed for particulate emissions are based on U. S. Environmental Protection Agency limitations for Best Available Control Technology (BACT) and Lowest Achievable Emission Rates (LAER). Emission factors not covered by BACT or LAER were derived by extrapolation from the process data contained in the USEPA document entitled, "Compilation of Air Pollution Emission Factors (AP-42 3rd Edition, August 1977)." The emission factors for continuous casting and argon stirring are based on industry experience. Respective plant activities have been identified as individual emission sources in accordance with their

sequential steps in process operation. These plant sources are delineated in Table 1-23 for annual average emissions, and in Table 1-24 for 24-hour average emmssions. Each table lists the process steps, facilities or activities which give rise to emissions. The first section of each table presents the physical descriptions and operating parameters of each itemized source. In addition, this section lists the time, in hours per year, during which the source would be on-line and the step annual production rate. The next section characterizes the fuel and equivalent energy parameters. Designated emission limitations or recognized emission factors subject to the pollution control emission reduction is also stated, together with the origin of the underlying emission factor. The emissions attributable to the operating activity at each source are reported in Section III of each table, with noncondensible gaseous emissions of SO_2, CO, and NO_x in Part IIIA, hydrocarbons in Part IIIB, and particulates both as controlled and fugitive in Part IIIC. The emission rates in each table are reported as averages in kilograms per hour during the time period of the table. Only insignificant quantities of flourides are anticipated since no flurospar will be used as process additions.

1.296
Although the USEPA has developed effluent guidelines (refer to Table 1-25) for individual iron and steel production units, an agreement has been reached between USEPA and U.S. Steel that the effluent quality of the discharge from the proposed plant will be evaluated at a single point. For the purpose of this environmental impact assessment it will not be necessary to project discharge water quality from each treatment system. However, this does not necessarily absolve the applicant of the potential requirement that specified water quality limits be met for individual process unit discharges. Under this provision, it is conceivable that an individual system might exceed guideline limits; however, the plant as a whole is expected to meet the limits set forth under the U.S. Steel waste load projection presented in Table 1-26. By using the wastewater treatment facilities described in the preceding section, U.S. Steel believes that it can achieve the total process wastewater effluent limitations presented in Table 1-25, with the exception of the limitation on ammonia. U.S. Steel is of the opinion that reliable technology capable of meeting the EPA effluent limitation on ammonia does not presently exist. Rather than the 398 lbs/day ammonia limitations set forth by the EPA, U.S. Steel believes that its ammonia waste load will be 525 lbs/day (based on 30-day average values). The question of whether U.S. Steel's proposed higher ammonia effluent loading is warranted will be considered by the Effluent Guidelines Division of EPA during the NPDES permit review.

Table 1-23

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18 1977
I – Page 1 of 6

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS HANDLING

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area**	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			(U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Height (m)	Diam. (m)	Height (m)	Temp (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10^6 tonnes/yr	Other Characteristics
	Ore												
1	Ore Unloading	P	7.39	6.43	183						6570	2.60	Existing Activity
2	Ore Transfer	P	7.39	6.43	183						6570	2.60	Existing Activity
3	Ore Stocking	A	7.75	5.75	195						6570	2.60	Existing Activity
4	Ore Storage	A	7.75	5.75	195						8760	0.90	Existing Activity
5	Ore Transfer	P	8.75	5.92	195	50	0.7		Amb.	15	8760	2.60	Enclosed
	Pellets												
6	Pellet Unloading	P	7.38	6.62	183						7300	7.10	Existing Activity
7	Pellet Transfer	P	7.38	6.62	183						7300	7.10	Existing Activity
8	Pellet Storage	A	7.75	5.75	195						8760	1.80	Existing Activity
9	Pellet Transfer	P	8.75	5.92	195						8760	7.10	(Included w/ #5 Above)
10	Pellet Transfer	P	9.37	6.18	195	50	0.6		Amb.	15	8760	7.1	Enclosed
11	Pellet Transfer	P	9.48	5.92	195	50	0.7		Amb.	15	8760	7.1	Enclosed
	Limestone												
12	Limestone Unloading	P	8.25	6.03	183						6570	1.30	Existing Activity
13	Limestone Stocking	A	7.75	5.75	195						6570	1.30	Existing Activity
14	Limestone Storage	A	7.75	5.75	195						8760	0.30	Existing Activity
15	Limestone Transfer	P	8.75	5.92	195						8760	1.30	(Included w/ #5 Above)
	Coal												
16	Coal Dumping	P	8.88	4.63	200						8760	5.50	Relocated Existing Activity
17	Blending and Storage	A	8.75	4.75	195						8760	0.66	
18	Coal Transfer	P	9.17	5.69	192						8760	5.50	(Included [illegible])

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*All UTM coordinates listed as 53X XX/464X XX Km, except as otherwise specified.

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner.

Sources: United States Steel Corporation, Arthur D. Little, Inc.

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18 1977
I – Page 2 of 6

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS PROCESSING

Plant Location: Conneaut Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area**	Location (U.S. Topographic Maps – UTM Coordinates)*		Location: Base Elevation (m)	Stack(s) Height (m)	Stack(s) Diam (m)	Roof Monitor(s) Height (m)	Exhaust Temp (°C)	Exhaust Velocity (m/sec)	Operating Characteristics: Time (hours/yr)	Operating Characteristics: Quantity 10⁶ tonnes/yr	Operating Characteristics: Other Characteristics
	Lime Plant												
19	Limestone Transfer	P	8.94	6.18	192	40	0.6		Amb	15	8160	1.30	
20	Lime Kiln Exhaust	P	8.99	6.13	192	30	1.5		200	13	8160	0.27	
21	Lime Kiln Exhaust	P	8.95	6.11	192	30	1.5		200	13	8160	0.27	
22	Lime Handling	P	9.06	6.12	192	30	1.7		40	13	8160	0.54	
	Coke Plant Operations												
23	Coal Crush and Mix	P	9.17	5.69	192	30	1.0		Amb	10.6	8760	4.80	(Includes Source #18)
24	Coal Transfer	P	9.18	5.63	192	40	0.4		Amb	15	8760	4.80	
25	Coal Transfer	P	9.32	5.69	192	40	0.4		Amb	15	8760	2.40	
26	Coal Transfer	P	9.33	5.64	192	40	0.4		Amb	15	8760	2.40	
27	Coal Preheaters – S	P	9.09	5.55	192	50	1.0		55	15	8760	2.40	
28	Coal Preheaters – N	P	9.50	6.13	192	50	1.0		55	15	8760	2.40	
29	Coal Charge Bins – N	P	9.32	5.44	192	50	1.2		55	15	8760	2.40	25% Operating Time
30	Coal Charge Bins – S	P	9.46	5.12	192	50	1.2		55	15	8760	2.40	25% Operating Time
31	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
32	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
33	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
34	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
35	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
36	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
37	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
38	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
39	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
40	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	

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*All UTM coordinates listed as 53X.XX/464X.XX Km. except as otherwise specified

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
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Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS PROCESSING (Cont.)

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area**	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			(U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Height (m)	Diam (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10^6 tonnes/yr	Other Characteristics
	Coke Plant Operations (Cont.)												
41	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
42	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
43	Quench Station – N	P	9.27	5.63	192	20	5.6		75	5	8760	1.62	Two Minutes/Push
44	Quench Station – S	P	9.55	4.95	192	20	5.6		75	5	8760	1.62	Two Minutes/Push
45	Coke Wharf Transfer	P	9.33	5.66	192	30	0.4		40	15	8760	3.25	
46	Crushing and Screening	P	9.45	6.07	192	30	0.8		Amb.	15	8760	1.62	
47	Crushing and Screening	P	9.50	5.95	192	30	0.8		Amb.	15	8760	1.62	
48	Coke Oven Stack	P	9.22	5.50	192	100	3.5		227	15.6	8760	0.81	Design Provision For Future Control Installation
49	Coke Oven Stack	P	9.29	5.34	192	100	3.5		227	15.6	8760	0.81	
50	Coke Oven Stack	P	9.36	5.17	192	100	3.5		227	15.6	8760	0.81	
51	Coke Oven Stack	P	9.42	5.01	192	100	3.5		227	15.6	8760	0.81	
52	Coke Oven Fugitives	A	8.75	4.75	192			20			8760	3.25	
	Sinter Plant Operations												
53	Sinter Feed Transfer	P	9.64	6.26	192	50	0.7		Amb.	15	8160		
54	Sinter Screening	P	9.15	6.71	192	50	3.8		40	18	8160	3.08	
55	Sinter Exhaust	P	9.05	6.74	192	50	1.5		55	13	8160	3.08	Equiv. for 18 Stacks
56	Sinter Plant Fugitives	A	8.75	5.75	192			40			8160	3.08	
57	Sinter Transfer	P	9.37	6.18	192						8160	1.54	(Included w/ #10)
58	Sinter Transfer	P	9.48	5.92	192						8160	1.54	(Included w/ #11)

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
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Plant Location: Conneaut Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

I – EMISSION SOURCE DESCRIPTIONS

IRON AND STEELMAKING PROCESSES

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area**	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			(U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Height (m)	Diam (m)	Height (m)	Temp (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10^6 tonnes/yr	Other Characteristics
	Blast Furnace Operations												
59	Burden Transfer	P	9.45	6.07	192			80	Amb		8400	6.70	
60	Burden Transfer	P	9.50	5.95	192			80	Amb		8400	6.70	
61	Stockhouse Screen	P	9.54	5.96	192	30	0.85		Amb	15	8400	6.70	
62	Stockhouse Screen	P	9.48	6.08	192	30	0.85		Amb	15	8400	6.70	
63	Tapping	P	9.94	6.14	192	40	5.4		75	15	8400	3.25	
64	Tapping	P	9.85	6.13	192	40	5.4		75	15	8400	3.25	
65	Stove Exhaust	P	540.04	6.15	192	75	5.6		275	16.2	8760	3.25	
66	Stove Exhaust	P	9.77	6.07	192	75	5.6		275	16.2	8760	3.25	
67	Flare Stack	P	540.02	6.18	192	50	1.0		1200	15	80		Emergency Only
68	Flare Stack	P	9.75	6.11	192	50	1.0		1200	15	80		Emergency Only
69	BF Fugitives	A	9.75	5.75	192			50			8760	3.25	
70	BF Fugitives	A	9.75	5.75	192			50			8760	3.25	
71	Hot Metal DeSul	P	9.82	6.26	192	30	1.1		75	20	8760	6.50	
72	Hot Metal Mixer	P	9.79	6.30	192	30	5.2		75	15	8760	3.25	25% Operating Time
	Steelmaking Operations												
73	Hot Metal Charging				192						8760	6.80	Detailed in 78, 79, 80
74	Scrap Preparation	A	9.75	5.75	192				Amb		2000	1.00	
75A	Steelmaking Exhaust	P	9.71	6.47	192	75	3.0		1340	20	5870	2.27	20% of Cycle Time
75B	Steel Tapping	P	9.71	6.47	192	75	3.0		45	15	5870	2.27	20% of Cycle Time
76A	Steelmaking Exhaust	P	9.72	6.45	192	75	3.0		1340	20	5870	2.27	20% of Cycle Time
76B	Steel Tapping	P	9.72	6.45	192	75	3.0		45	15	5870	2.27	20% of Cycle Time
77A	Steelmaking Exhaust	P	9.73	6.43	192	75	3.0		1340	20	5870	2.27	20% of Cycle Time
77B	Steel Tapping	P	9.73	6.43	192	75	3.0		45	15	5870	2.27	20% of Cycle Time
78	Hot Metal Charging	P	9.71	6.47	192	75	6.0		45	15	5870	2.27	10% of Cycle Time
79	Hot Metal Charging	P	9.72	6.45	192	75	6.0		45	15	5870	2.27	10% of Cycle Time
80	Hot Metal Charging	P	9.73	6.43	192	75	6.0		45	15	5870	2.27	10% of Cycle Time
81	Steelmaking Fugitives	A	9.75	5.75	192			40			8760	6.80	

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* All UTM coordinates listed as 53X.XX/464X.XX Km except as otherwise specified

** All area sources are components of squares 1.0 Km on edge from coordinates for SW corner

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
I - Page 5 of 5

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

I – EMISSION SOURCE DESCRIPTIONS

STEEL WORKING PROCESSES & SUPPORTING OPERATIONS

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			(U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Height (m)	Diam. (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10⁶ tonnes/yr	Other Characteristics
	Continuous Casting Operations												
82	Teeming & Casting	A	9.75	5.75	192			45	40		8760	6.35	
83	Tundish Dumping & Cleaning	A	9.75	5.75	192	60	2.0	45	Amb.	15	730		Occurs 2 Hours Per Day
84	Argon Stirring	A	9.75	5.75	192			45	Amb.		8760	6.35	10% of Cycle Time
85	Slab Cutting	P	9.92	6.50	192					10	8760	6.35	Fumeless Burners
86	Spot Scarfing	P	540.02	6.61	192	30	1.5		56	10	8000		35% of Output
87	Machine Scarfing	P	9.98	6.69	192	30	2.5		56	15	1300		15% of Output
	Rolling Mill Operations												
89	Strip Reheat	P	540.10	6.72	192	50	6.0		780	16.7	8000	1.51	
90	Strip Reheat	P	540.13	6.73	192	50	6.0		780	16.7	8000	1.51	
91	Strip Reheat	P	540.16	6.75	192	50	6.0		780	16.7	8000	1.51	
93	Plate Reheat	P	540.18	6.43	192	50	4.4		780	15.7	7900	0.81	
94	Plate Reheat	P	540.24	6.46	192	50	4.4		780	15.7	7900	0.81	
95	Plate Cutting	A	9.75	5.75	192			25			7500	0.28	Fumeless Burners
96	Plate Normalizing	P	540.40	6.40	192	40	2.0		435	10.4	1500	0.22	
	Other Supporting Operations												
98	Boiler Exhaust	P	9.11	5.90	192	50	3.7		149	16.9	8760		
99	Boiler Exhaust	P	9.12	5.88	192	50	3.7		149	16.9	8760		
100	Boiler Exhaust	P	9.13	5.86	192	50	3.7		149	16.9	8760		
101	Boiler Exhaust	P	9.14	5.84	192	50	3.7		149	16.9	8760		
102	Boiler Exhaust	P	9.15	5.82	192	50	3.7		149	16.9	8760		
103A	Slag Processing Plant	P	540.86	6.00	192	30	1.8		Amb.	15	2000	1.00	
103B	Slag Processing Storage	A	540.75	5.50	192			25	Amb.		2000	1.00	
104	Solid Waste Disposal	A									2000		
105	Plant RR System	A									8760		36,000 mi. Yr
106	Plant Road System	A									8760		1,000 mi. Day

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
II Page 1 of 5

II – FUEL UTILIZATION

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

Plant Source #	Operating Units/Facility (s)	Fuel Demand					Fuel Energy Demand (10^6 Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q–BOP Gas (Nm³/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Base	
																	Parameter	Source
	Ore																	
1	Ore Unloading												–				(Included w/ #3)	
2	Ore Transfer												–				(Included w/ #3)	
3	Ore Stocking												Wet Spray			90	0.005 Kg/mt	AP-42
4	Ore Storage												Wet Spray			Total	Negligible	BACT
5	Ore Transfer												Baghouse	300	Amb	99	24 mg/Nm^3	BACT
	Pellets																	
6	Pellet Unloading												–				Negligible	
7	Pellet Transfer												Wet Spray				Negligible	
8	Pellet Storage																Negligible	
9	Pellet Transfer												Baghouse	(Included w/ #5)				
10	Pellet Transfer												Baghouse	250	Amb		24 mg/Nm^3	BACT
11	Pellet Transfer												Baghouse	360	Amb		24 mg/Nm^3	BACT
	Limestone																	
12	Limestone Unloading												–				(Included w/ #13)	
13	Limestone Stocking												Wet Spray			90	0.005 Kg/mt	AP-42
14	Limestone Storage												Wet Spray			Total	Negligible	BACT
15	Limestone Transfer												Baghouse	(Included w/ #5)				
	Coal																	
16	Coal Dumping												Wet Spray			Total	Negligible	BACT
17	Blending and Storage												Wet Spray			Total	Negligible	BACT
18	Coal Transfer												Baghouse	(Included w/ #23)				

Table 1-23 (Continued)
UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
II Page 2 of 5

II – FUEL UTILIZATION

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Section #	Operating Units/Facility (a)	Fuel Demand					Fuel Energy Demand (10^6 Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm^3/hr)	Coke Oven Gas (Nm^3/hr)	Q–BOP Gas (Nm^3/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm^3/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Basis	
																	Parameter	Source
	Lime Plant																	
19	Limestone Transfer												Baghouse	200	Amb	99	24 mg/Nm^3	BACT
20	Lime Kiln Exhaust		9700					42.7					Baghouse	1225	200	99	48 mg/Nm^3	BACT
21	Lime Kiln Exhaust		9700					42.7					Baghouse	1225	200	99	48 mg/Nm^3	BACT
22	Lime Handling												Baghouse	1700	40	99	24 mg/Nm^3	BACT
	Coke Plant Operations																	
23	Coal Crush and Mix												Baghouse	500	Amb	99	24 mg/Nm^3	BACT
24	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm^3	BACT
25	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm^3	BACT
26	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm^3	BACT
27	Coal Preheaters – S		9300					40.9					Wet ESP	2x540	55		48 mg/Nm^3 Wet Train	LAER
28	Coal Preheaters – N		9300					40.9					Wet ESP	2x540	55		48 mg/Nm^3 Wet Train	LAER
29	Coal Charge Bins – N												Wet ESP	2x700	55		48 mg/Nm^3 Wet Train	LAER
30	Coal Charge Bins – S												Wet ESP	2x700	55		48 mg/Nm^3 Wet Train	LAER
31	Coke Battery Charging															95	0.075 #/ton coal	AP-42
32	Coke Battery Charging															95	0.075 #/ton coal	AP-42
33	Coke Battery Charging															95	0.075 #/ton coal	AP-42
34	Coke Battery Charging															95	0.075 #/ton coal	AP-42
35	Coke Battery Pushing															90	0.06 #/ton coal	AP-42
36	Coke Battery Pushing															90	0.06 #/ton coal	AP-42
37	Coke Battery Pushing															90	0.06 #/ton coal	AP-42
38	Coke Battery Pushing															90	0.06 #/ton coal	AP-42
39	Coke Container Car												Scrubber	2400		90	0.03 lb/ton coke	LAER
40	Coke Container Car												Scrubber	2400		90	0.03 lb/ton coke	LAER

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
II Page 3 of 5

II – FUEL UTILIZATION

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rate

Plant Source #	Operating Units/Facility (a)	Fuel Demand						Fuel Energy Demand (10⁶ kcal/hr)							Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q-BOP Gas (Nm³/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Coke (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Coke	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Basis	
																			Parameter	Source
	Coke Plant Operations (Cont.)																			
41	Coke Container Car														Scrubber	2400	Amb	90	0.03 lb/ton Coke	LAER
42	Coke Container Car														Scrubber	2400	Amb	90	0.03 lb/ton Coke	LAER
43	Quench Station – N														Baffled Tower		75		0.25 lb/ton Coke	LAER
44	Quench Station – S														Baffled Tower		75		0.25 lb/ton Coke	LAER
45	Coke Wharf Transfer														Baghouse	100	40	99	24mg/Nm³	BACT
46	Crushing and Screening														Baghouse	450	Amb	99	24mg/Nm³	BACT
47	Crushing and Screening														Baghouse	450	Amb	99	24mg/Nm³	BACT
48	Coke Oven Stack	64 900	1700					49.9	7.6						Stack	2150	227		36 mg/Nm³	LAER
49	Coke Oven Stack	64 900	1700					49.9	7.6						Stack	2150	227		36 mg/Nm³	LAER
50	Coke Oven Stack	64 900	1700					49.9	7.6						Stack	2150	227		36 mg/Nm³	LAER
51	Coke Oven Stack	64,900	1700					49.9	7.6						Stack	2150	227		36 mg/Nm³	LAER
52	Coke Oven Fugitives																	90	0.01 lb/ton	AP 42
	Sinter Plant Operations																			
53	Sinter Feed Transfer														Baghouse	300	Amb	99	24mg/Nm³	BACT
54	Sinter Screening														Baghouse	10 000	40	99	24mg/Nm³	BACT
55	Sinter Exhaust		8000				(32)		28.4				(230)		Cyclones and Wet ESP	23 560	55	99	98mg/Nm³	LAER
56	Sinter Plant Fugitives																	90	0.07 lb/ton	AP 42
57	Sinter Transfer														Baghouse	(Included with #10)				
58	Sinter Transfer														Baghouse	(Included with #11)				

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
II - Page 4 of 5

II – FUEL UTILIZATION

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

Plant Source #	Operating Units/Facility Id	Fuel Demand					Fuel Energy Demand (10^6 Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q–BOP Gas (Nm³/hr)	Oil (kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Basis: Parameter	Design Emission Basis: Source
	Blast Furnace Operations																	
59	Burden Transfer												Wet Spray			Total	Dust Suppression	
60	Burden Transfer												Wet Spray			Total	Dust Suppression	
61	Stockhouse Screen												Baghouse	500			24 mg/Nm³	BACT
62	Stockhouse Screen												Baghouse	500			24 mg/Nm³	BACT
63	Tapping												Baghouse	20,000		95	0.025 lb/Ton *	BACT
64	Tapping												Baghouse	20,000		95	0.025 lb/Ton *	BACT
65	Stove Exhaust	167,700	23,200				128.9	102.2					Stack				12 mg/Nm³ Fuel	BACT
66	Stove Exhaust	167,700	23,200				128.9	102.2					Stack				12 mg/Nm³ Fuel	BACT
67	Flare Stack	3,100					2.5						Flare Stack				12 mg/Nm³ Fuel	BACT
68	Flare Stack	3,100					2.5						Flare Stack				12 mg/Nm³ Fuel	BACT
69	BF Fugitives															95	0.025 lb/Ton *	BACT
70	BF Fugitives															95	0.025 lb/Ton *	BACT
71	Hot Metal DeSul												Baghouse	1,000			40 mg/Nm³	BACT
72	Hot Metal Mixer												Baghouse	6,700			40 mg/Nm³	BACT
	Steelmaking Operations																	
73	Hot Metal Charging																	
74	Scrap Preparation																	
75A	Steelmaking Exhaust												Hi Energy Scrubber	3,500		Total	36 mg/Nm³	BACT
75B	Steel Tapping		700					3.2					Hi Energy Scrubber	3,500		98	0.006 lb/Ton	BACT
76A	Steelmaking Exhaust												Hi Energy Scrubber	3,500		Total	36 mg/Nm³	BACT
76B	Steel Tapping		700					3.2					Hi Energy Scrubber	3,500		98	0.006 lb/Ton	BACT
77A	Steelmaking Exhaust												Hi Energy Scrubber	3,500		Total	36 mg/Nm³	BACT
77B	Steel Tapping		700					3.2					Hi Energy Scrubber	3,500		98	0.006 lb/Ton	BACT
78	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
79	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
80	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
81	Steelmaking Fugitives															98		BACT

*Based on 0.5 lb/ton hot metal with capture of 95% and removal of 95%.

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
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H – FUEL UTILIZATION

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Source #	Operating Units/Facility (a)	Fuel Demand					Fuel Energy Demand (10^6 Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q-BOP Gas (Nm³/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Data	
																	Parameter	Source
	Continuous Casting Operations																	
82	Teeming & Casting		27,800					122.8				122.8	Process Control			99	0.015 lb/Ton Steel	
83	Tundish Dumping & Cleaning												Baghouse	2800	Amb		48 mg/Nm³	BACT
84	Argon Stirring												Process Control				<100 mg/m Ton	
85	Slab Cutting																Negligible	
86	Spot Scarfing												Baghouse	1080	56		24 mg/Nm³	BACT
87	Machine Scarfing												Wet ESP	2400	56		24 mg/Nm³	BACT
	Rolling Mill Operations																BACT on Fuels	
89	Strip Reheat	7900	10,200		2800		6.1	44.7		29.6		80.4	Stack				BFG @ 12 mg/Nm³	
90	Strip Reheat	7900	10,200		2800		6.1	44.7		29.6		80.4	Stack				COG @ 12 mg/Nm³	
91	Strip Reheat	7800	10,200		2800		6.1	44.7		29.6		80.4	Stack				Oil @ 0.1 lb/MMBtu	
93	Plate Reheat	4000	5,200		4000		3.1	22.8		41.1		67.1	Stack					
94	Plate Reheat	4000	5,200		4000		3.1	22.8		41.1		67.1	Stack					
95	Plate Cutting																Negligible	
96	Plate Normalizing		1,100					5.1					Stack				COG @ 12 mg/Nm³	BACT
	Other Supporting Operations																BACT on Fuels	
98	Boiler Exhaust	124,400		9100		5.74	95.6		18.2		41.5	155.3	ESP				BFG @ 12 mg/Nm³	
99	Boiler Exhaust	124,400		9100		5.74	95.6		18.2		41.5	155.3	ESP				Q BG @ 38 mg/Nm³	
100	Boiler Exhaust	124,000		9100		5.74	95.6		18.2		41.5	155.3	ESP				Coal @ 0.1 lb/MMBtu	
101	Boiler Exhaust	124,000		9100		5.74	95.6		18.2		41.5	155.3	ESP					
102	Boiler Exhaust	124,000		9100		5.74	95.6		18.2		41.5	155.3	ESP					
103A	Slag Processing Plant												Baghouse	500	Amb	90	24 mg/Nm³	BACT
103B	Slag Processing Storage												Wet Spray			Total	Negligible	BACT
104	Solid Waste Disposal																	
105	Plant RR System																0.075 lb/Gal	AP 42
106	Plant Road System																3 x 1.2 gm/m	AP 42

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov. 18, 1977
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III.A. – GASEOUS EMISSIONS

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined NO_x
	Ore																	
1	Ore Unloading																	
2	Ore Transfer																	
3	Ore Stocking																	
4	Ore Storage																	
5	Ore Transfer																	
	Pellets																	
6	Pellet Unloading																	
7	Pellet Transfer																	
8	Pellet Storage																	
9	Pellet Transfer																	
10	Pellet Transfer																	
11	Pellet Transfer																	
	Limestone																	
12	Limestone Unloading																	
13	Limestone Stocking																	
14	Limestone Storage																	
15	Limestone Transfer																	
	Coal																	
16	Coal Dumping																	
17	Blending and Storage																	
18	Coal Transfer																	

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - ANNUAL

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III.A – GASEOUS EMISSIONS

Plant Location Conneaut Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Combined NO_x
	Lime Plant																	
19	Limestone Transfer																	
20	Lime Kiln Exhaust	15.4				15.4						22.5						9.4
21	Lime Kiln Exhaust	15.4				15.4						22.5						9.4
22	Lime Handling																	
	Coke Plant Operations																	
23	Coal Crush and Mix																	
24	Coal Transfer																	
25	Coal Transfer																	
26	Coal Transfer																	
27	Coal Preheaters - S	14.8				14.8												9.0
28	Coal Preheaters - N	14.8				14.8												9.0
29	Coal Charge Bins - N																	
30	Coal Charge Bins - S																	
31	Coke Battery Charging					0.07						2.05						0.10
32	Coke Battery Charging					0.07						2.05						0.10
33	Coke Battery Charging					0.07						2.05						0.10
34	Coke Battery Charging					0.07						2.05						0.10
35	Coke Battery Pushing											0.48						
36	Coke Battery Pushing											0.48						
37	Coke Battery Pushing											0.48						
38	Coke Battery Pushing											0.48						
39	Coke Container Car																	
40	Coke Container Car																	

*SO_2 emissions decreased by 50% to 7.4 Kg/hr for each pair of preheaters due to use of wet ESP exhaust control system

Table 1-23 (Continued)

Nov 18, 1977

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

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III A. – GASEOUS EMISSIONS

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Combined NO_x
	Coke Plant Operations (Cont.)																	
41	Coke Container Car																	
42	Coke Container Car																	
43	Quench Station – N																	
44	Quench Station – S																	
45	Coke Wharf Transfer																	
46	Crushing and Screening																	
47	Crushing and Screening																	
48	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
49	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
50	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
51	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
52	Coke Oven Fugitives																	
	Sinter Plant Operations																	
53	Sinter Feed Transfer																	
54	Sinter Screening																	
55	Sinter Exhaust	(9.6)				240						10,600						243
56	Sinter Plant Fugitives																	
57	Sinter Transfer																	
58	Sinter Transfer																	

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
III A - Page 4 of 5

III.A – GASEOUS EMISSIONS

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Combined NO_x
	Blast Furnace Operations																	
59	Burden Transfer																	
60	Burden Transfer																	
61	Stockhouse Screen																	
62	Stockhouse Screen																	
63	Tapping																	
64	Tapping																	
65	Stove Exhaust	36.9				36.9	45.8	6.3				52.1	161.6	22.4				184.0
66	Stove Exhaust	36.9				36.9	45.8	6.3				52.1	161.6	22.4				184.0
67	Flare Stack						0.9					0.9	3.0					3.0
68	Flare Stack						0.9					0.9	3.0					3.0
69	BF Fugitives																	
70	BF Fugitives																	
71	Hot Metal DeSul					2												
72	Hot Metal Mixer																	
	Steelmaking Operations																	
73	Hot Metal Charging																	
74	Scrap Preparation																	
75A	Steelmaking Exhaust																	
75B	Steel Tapping	1.1				1.1												
76A	Steelmaking Exhaust																	
76B	Steel Tapping	1.1				1.1												
77A	Steelmaking Exhaust																	
77B	Steel Tapping	1.1				1.1												
78	Hot Metal Charging																	
79	Hot Metal Charging																	
80	Hot Metal Charging																	
81	Steelmaking Fugitives																	

Table 1-23 (Continued)
UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
III A – Page 5 of 5

III.A. – GASEOUS EMISSIONS

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined NO_x
	Continuing Casting Operations																	
82	Teeming & Casting	44.3				44.3		16.7				16.7		26.8				26.8
83	Tundish Dumping & Cleaning																	
84	Argon Stirring																	
85	Slab Cutting																	
86	Spot Scarfing																	
87	Machine Scarfing																	
	Rolling Mill Operations																	
89	Strip Reheat	16.2	64.0			80.2	2.1	2.8		1.4		6.3	7.6	9.8		20.7		38.1
90	Strip Reheat	16.2	64.0			80.2	2.1	2.8		1.4		6.3	7.6	9.8		20.7		38.1
91	Strip Reheat	16.2	64.0			80.2	2.1	2.8		1.4		6.3	7.6	9.8		20.7		38.1
93	Plate Reheat	8.2	88.7			97.0	1.1	1.4		2.0		4.5	3.8	5.0		29.5		38.3
94	Plate Reheat	8.3	88.7			97.0	1.1	1.4		2.0		4.5	3.8	5.0		29.5		38.3
95	Plate Cutting																	
96	Plate Normalizing	1.8				1.8		0.3				0.3		1.1				1.1
	Other Supporting Operations																	
98	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	35.4	2.3		2.9		16.1	21.3
99	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	35.4	2.3		2.9		16.1	21.3
100	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	35.4	2.3		2.9		16.1	21.3
101	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	35.4	2.3		2.9		16.1	21.3
102	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	35.4	2.3		2.9		16.1	21.3
103A	Slag Processing Plant																	
103B	Slag Processing Storage																	
104	Solid Waste Disposal																	
105	Plant RR System																	
106	Plant Road System																	

Table 1-23 (Continued)

Nov. 18, 1977

III B & III C. - Page 1 of 5

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

III.B. – GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	O-BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Ore						
1	Ore Unloading						
2	Ore Transfer						
3	Ore Stocking						
4	Ore Storage						
5	Ore Transfer						
	Pellets						
6	Pellet Unloading						
7	Pellet Transfer						
8	Pellet Storage						
9	Pellet Transfer						
10	Pellet Transfer						
11	Pellet Transfer						
	Limestone						
12	Limestone Unloading						
13	Limestone Stocking						
14	Limestone Storage						
15	Limestone Transfer						
	Coal						
16	Coal Dumping						
17	Blending and Storage						
18	Coal Transfer						

III.C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rates of Generation	Controlled Emissions	Fugitive Emissions
	Ore									
1	Ore Unloading									
2	Ore Transfer									
3	Ore Stocking							1.5		1.5
4	Ore Storage									Negligible
5	Ore Transfer								0.43	
	Pellets									
6	Pellet Unloading									
7	Pellet Transfer									
8	Pellet Storage									
9	Pellet Transfer								(Included in 25)	
10	Pellet Transfer								0.36	
11	Pellet Transfer								0.50	
	Limestone									
12	Limestone Unloading									
13	Limestone Stocking							0.7		0.7
14	Limestone Storage									Negligible
15	Limestone Transfer								(Included in 5)	
	Coal									
16	Coal Dumping									Negligible
17	Blending and Storage									Negligible
18	Coal Transfer								(Included in 23)	

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov. 18, 1977
III-B & III-C – Page 2 of 5

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors Annual Average Rates

III-B. – GASEOUS EMISSIONS

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	[illegible] Hydrocarbons
	Lime Plant						
19	Limestone Transfer						
20	Lime Kiln Exhaust						
21	Lime Kiln Exhaust						
22	Lime Handling						
	Coke Plant Operations						
23	Coal Crush and Mix						
24	Coal Transfer						
25	Coal Transfer						
26	Coal Transfer						
27	Coal Preheaters – S						Negligible
28	Coal Preheaters – N						Negligible
29	Coal Charge Bins – N						Negligible
30	Coal Charge Bins – S						Negligible
31	Coke Battery Charging						8.6
32	Coke Battery Charging						8.6
33	Coke Battery Charging						8.6
34	Coke Battery Charging						8.6
35	Coke Battery Pushing						1.4
36	Coke Battery Pushing						1.4
37	Coke Battery Pushing						1.4
38	Coke Battery Pushing						1.4
39	Coke Container Car						
40	Coke Container Car						

III-C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	[illegible] of Collection	Controlled Emissions	Fugitive Emissions
	Lime Plant									
19	Limestone Transfer								0.3	
20	Lime Kiln Exhaust								2.2	
21	Lime Kiln Exhaust								3.3	
22	Lime Handling								2.3	
	Coke Plant Operations									
23	Coal Crush and Mix								0.7	
24	Coal Transfer								0.15	
25	Coal Transfer								0.15	
26	Coal Transfer								0.15	
27	Coal Preheaters – S								3.1	
28	Coal Preheaters – N								3.1	
29	Coal Charge Bins – N								1.0	
30	Coal Charge Bins – S								1.0	
31	Coke Battery Charging									5.1
32	Coke Battery Charging									5.1
33	Coke Battery Charging									5.1
34	Coke Battery Charging									5.1
35	Coke Battery Pushing									2.8
36	Coke Battery Pushing									2.8
37	Coke Battery Pushing									2.8
38	Coke Battery Pushing									2.8
39	Coke Container Car								1.4	Treated as Fugitive
40	Coke Container Car								1.4	Treated as Fugitive

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
III B & III C – Page 3 of 5

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

III-B. – GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	O-BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Coke Plant Operations (Cont.)						
41	Coke Container Car						
42	Coke Container Car						
43	Quench Station – N						
44	Quench Station – S						
45	Coke Wharf Transfer						
46	Crushing and Screening						
47	Crushing and Screening						
48	Coke Oven Stack	3.1		0.1			3.3
49	Coke Oven Stack	3.1		0.1			3.3
50	Coke Oven Stack	3.1		0.1			3.3
51	Coke Oven Stack	3.1		0.1			3.3
52	Coke Oven Fugitives						
	Sinter Plant Operations						
53	Sinter Feed Transfer						
54	Sinter Screening						
55	Sinter Exhaust						72.6
56	Sinter Plant Fugitives						
57	Sinter Transfer						
58	Sinter Transfer						

III-C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rates of Generation	Controlled Emissions	Fugitive Emissions
	Coke Plant Operations (Cont.)									
41	Coke Container Car								1.4	Treated as Fugitives
42	Coke Container Car								1.4	Treated as Fugitives
43	Quench Station – N								23.2	
44	Quench Station – S								23.2	
45	Coke Wharf Transfer								0.15	
46	Crushing and Screening								0.7	
47	Crushing and Screening								0.7	
48	Coke Oven Stack								4.7	
49	Coke Oven Stack								4.7	
50	Coke Oven Stack								4.7	
51	Coke Oven Stack								4.7	
52	Coke Oven Fugitives									[illegible]
	Sinter Plant Operations									
53	Sinter Feed Transfer								0.43	
54	Sinter Screening								4.4	
55	Sinter Exhaust								8.1	
56	Sinter Plant Fugitives									[illegible]
57	Sinter Transfer							[illegible]	[illegible]	10
58	Sinter Transfer							[illegible]	[illegible]	11

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - ANNUAL

Nov 18 1977
III B & III C - Page 4 of 5

Plant Location Conneaut Ohio
Year of Data Base Year
Special Factors Annual Average Rates

III.B. - GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Blast Furnace Operations						
59	Burden Transfer						
60	Burden Transfer						
61	Stockhouse Screen						
62	Stockhouse Screen						
63	Tapping						
64	Tapping						
65	Stove Exhaust	0.1		1.2			0.2
66	Stove Exhaust	0.1		1.2			0.2
67	Flare Stack	0.15					0.15
68	Flare Stack	0.15					0.15
69	BF Fugitives						
70	BF Fugitives						
71	Hot Metal DeSul						
72	Hot Metal Mixer						
	Steelmaking Operations						
73	Hot Metal Charging						
74	Scrap Preparation						
75A	Steelmaking Exhaust						
75B	Steel Tapping						
76A	Steelmaking Exhaust						
76B	Steel Tapping						
77A	Steelmaking Exhaust						
77B	Steel Tapping						
78	Hot Metal Charging						
79	Hot Metal Charging						
80	Hot Metal Charging						
81	Steelmaking Fugitives						

III.C. - PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rates of Generation	Controlled Emissions	Fugitive Emissions
	Blast Furnace Operations									
59	Burden Transfer									
60	Burden Transfer									
61	Stockhouse Screen								0.7	
62	Stockhouse Screen								0.7	
63	Tapping								0.88	
64	Tapping								0.88	
65	Stove Exhaust	2.0	0.3				2.3		2.3	
66	Stove Exhaust	2.0	0.3				2.3		2.3	
67	Flare Stack	0.04					0.04		0.04	
68	Flare Stack	0.04					0.04		0.04	
69	BF Fugitives									4.6 @ 50%
70	BF Fugitives									4.6 @ 50%
71	Hot Metal DeSul								2.9	
72	Hot Metal Mixer								4.9	
	Steelmaking Operations									
73	Hot Metal Charging									
74	Scrap Preparation									
75A	Steelmaking Exhaust								1.00	
75B	Steel Tapping								0.40	
76A	Steelmaking Exhaust								1.00	
76B	Steel Tapping								0.40	
77A	Steelmaking Exhaust								1.00	
77B	Steel Tapping								0.40	
78	Hot Metal Charging								0.80	
79	Hot Metal Charging								0.80	
80	Hot Metal Charging								0.80	
81	Steelmaking Fugitives									6.0 @ 50%

Table 1-23 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – ANNUAL

Nov 18, 1977
III B & III C – Page 5 of 5

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: Annual Average Rates

III.B. – GASEOUS EMISSIONS

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q–BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Continuing Casting Operations						
82	Teeming & Casting			1.4			1.4
83	Tundish Dumping & Cleaning						
84	Argon Stirring						
85	Slab Cutting						
86	Spot Scarfing						
87	Machine Scarfing						
	Rolling Mill Operations						
89	Strip Reheat	0.37		0.5	0.68		1.5
90	Strip Reheat	0.37		0.5	0.68		1.5
91	Strip Reheat	0.37		0.5	0.68		1.5
93	Plate Reheat	0.26		0.26	1.47		1.9
94	Plate Reheat	0.26		0.26	1.47		1.9
95	Plate Cutting						
96	Plate Normalizing	0.05		0.05			
	Other Supporting Operations						
98	Boiler Exhaust	5.99	0.4			0.87	7.3
99	Boiler Exhaust	5.99	0.4			0.87	7.3
100	Boiler Exhaust	5.99	0.4			0.87	7.3
101	Boiler Exhaust	5.99	0.4			0.87	7.3
102	Boiler Exhaust	5.99	0.4			0.87	7.3
103A	Slag Processing Plant						
103B	Slag Processing Storage						
104	Solid Waste Disposal						
105	Plant RR System						
106	Plant Road System						

Sources: United States Steel Corporation, Arthur D. Little, Inc.

III.C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Particulates From Fuel Use	Rates of Generation	Controlled Emissions	Fugitive Emissions
	Continuing Casting Operations									
82	Teeming & Casting									5.8 @ 50%
83	Tundish Dumping & Cleaning								0.63	Negligible
84	Argon Stirring									0.1 @ 50%
85	Slab Cutting									
86	Spot Scarfing								1.43	
87	Machine Scarfing								1.00	
	Rolling Mill Operations									
89	Strip Reheat	0.10	12		5.33				5.6	
90	Strip Reheat	0.10	12		5.33				5.6	
91	Strip Reheat	0.10	12		5.33				5.6	
93	Plate Reheat	0.05	06		7.4				7.5	
94	Plate Reheat	0.06	06		7.4				7.5	
95	Plate Cutting									
96	Plate Normalizing		01						0.01	
	Other Supporting Operations									
98	Boiler Exhaust	1.50		33		7.5			9.3	
99	Boiler Exhaust	1.50		33		7.5			9.3	
100	Boiler Exhaust	1.50		33		7.5			9.3	
101	Boiler Exhaust	1.50		33		7.5			9.3	
102	Boiler Exhaust	1.50		33		7.5			9.3	
103A	Slag Processing Plant								0.16	
103B	Slag Processing Storage									Negligible
104	Solid Waste Disposal									Negligible
105	Plant RR System									0.5
106	Plant Road System									0.45

Table 1-24

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
(Page 1 of 5

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS HANDLING

Plant Location Conneaut Ohio
Year of Data Base Year
Special Factors 24 Hour Rates

Plant Source #	Operating Units/Facility (a)	Source Type Point/Area**	Location (U.S. Topographic Maps – UTM Coordinates)*		Location Base Elevation (m)	Stack(s) Height (m)	Stack(s) Diam. (m)	Roof Monitor(s) Height (m)	Exhaust Temp. (°C)	Exhaust Velocity (m/sec)	Operating Characteristics Time (hours/yr.)	Operating Characteristics Quantity (10⁶ tonnes/yr)	Operating Characteristics Other Characteristics
	Ore												
1	Ore Unloading	P	7.30	6.43	183						6570	2.80	Existing Activity
2	Ore Transfer	P	7.30	6.43	183						6570	2.80	Existing Activity
3	Ore Stacking	A	7.75	5.75	195						6570	2.80	Existing Activity
4	Ore Storage	A	7.75	5.75	195						8760	0.80	Existing Activity
5	Ore Transfer	P	8.75	5.92	195	50	0.7		Amb.	15	8760	2.80	Enclosed
	Pellets												
6	Pellet Unloading	P	7.30	6.62	183						7300	7.10	Existing Activity
7	Pellet Transfer	P	7.38	6.62	183						7300	7.10	Existing Activity
8	Pellet Storage	A	7.75	5.75	195						8760	1.80	Existing Activity
9	Pellet Transfer	P	8.75	5.92	195						8760	7.10	(Included w/ #5 Above)
10	Pellet Transfer	P	8.37	6.16	195	50	0.6		Amb.	15	8760	7.1	Enclosed
11	Pellet Transfer	P	9.48	5.92	195	50	0.7		Amb.	15	8760	7.1	Enclosed
	Limestone												
12	Limestone Unloading	P	8.25	6.03	183						6570	1.20	Existing Activity
13	Limestone Stacking	A	7.75	5.75	195						6570	1.30	Existing Activity
14	Limestone Storage	A	7.75	5.75	195						8760	0.30	Existing Activity
15	Limestone Transfer	P	8.75	5.92	195						8760	1.30	(Included w/ #5 Above)
	Coal												
16	Coal Dumping	P	8.88	4.83	200						8760	5.50	Relocated Existing Activity
17	Blending and Storage	A	8.75	4.75	195						8760	0.06	
18	Coal Transfer	P	9.17	5.80	192						8760	5.50	(Included w/ #23)

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner.

Source: United States Steel Corporation; Arthur D. Little, Inc.

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov. 18, 1977
I-Page 2 of 5

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS PROCESSING

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24-Hour Rates

Plant Source #	Operating Units/Facility (a)	Source Type Point/Area**	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			(U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Height (m)	Diam. (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10⁶ tonnes/yr	Other Characteristics
	Lime Plant												
19	Limestone Transfer	P	8.94	6.18	192	40	0.8		Amb.	15	8160	1.30	
20	Lime Kiln Exhaust	P	8.90	6.13	192	30	1.5		200	13	8160	0.27	
21	Lime Kiln Exhaust	P	8.95	6.11	192	30	1.5		200	13	8160	0.27	
22	Lime Handling	P	9.06	6.12	192	30	1.7		40	13	8160	0.54	
	Coke Plant Operations												
23	Coal Crush and Mix	P	9.17	5.88	192	30	1.0		Amb.	10.6	8760	4.80	(Includes Source #18)
24	Coal Transfer	P	9.18	5.63	192	40	0.4		Amb.	15	8760	4.80	
25	Coal Transfer	P	9.32	5.80	192	40	0.4		Amb.	15	8760	2.40	
26	Coal Transfer	P	9.33	5.84	192	40	0.4		Amb.	15	8760	2.40	
27	Coal Preheaters – S	P	9.09	5.55	192	50	1.0		55	15	8760	2.40	
28	Coal Preheaters – N	P	9.50	6.13	192	50	1.0		55	15	8760	2.40	
29	Coal Charge Bins – N	P	9.32	5.44	192	50	1.2		55	15	8760	2.40	25% Operating Time
30	Coal Charge Bins – S	P	9.46	5.12	192	50	1.2		55	15	8760	2.40	25% Operating Time
31	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
32	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
33	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
34	Coke Battery Charging	A	8.75	4.75	192			20			8760	1.20	
35	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
36	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
37	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
38	Coke Battery Pushing	A	8.75	4.75	192			20			8760	0.81	
39	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
40	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner.

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
1-Page 3 of 5

I – EMISSION SOURCE DESCRIPTIONS

RAW MATERIALS PROCESSING (Cont.)

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24 Hour Rates

Plant Source #	Operating Units/Facility (s)	Source Type Point/Area**	Location			Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
			U.S. Topographic Maps – UTM Coordinates*		Base Elevation (m)	Height (m)	Diam. (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr.)	Quantity 10^6 tonnes/yr	Other Characteristics
	Coke Plant Operations (Cont.)												
41	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
42	Coke Container Car	A	8.75	4.75	192			20			8760	0.81	
43	Quench Station – N	P	9.27	5.63	192	20	5.6		75	5	8760	1.62	Two Minutes/Push
44	Quench Station – S	P	9.56	4.96	192	20	5.6		75	5	8760	1.62	Two Minutes/Push
45	Coke Wharf Transfer	P	9.33	5.66	192	30	0.4		40	15	8760	3.25	
46	Crushing and Screening	P	9.46	6.07	192	30	0.8		Amb.	15	8760	1.62	
47	Crushing and Screening	P	9.50	5.96	192	30	0.8		Amb.	15	8760	1.62	
48	Coke Oven Stack	P	9.22	5.50	192	100	3.5		227	15.6	8760	0.81	Design Provision
49	Coke Oven Stack	P	9.29	5.34	192	100	3.5		227	15.6	8760	0.81	For Future Control
50	Coke Oven Stack	P	9.36	5.17	192	100	3.5		227	15.6	8760	0.81	Installation
51	Coke Oven Stack	P	9.42	5.01	192	100	3.5		227	15.6	8760	0.81	
52	Coke Oven Fugitives	A	8.75	4.75	192			20			8760	3.25	
	Sinter Plant Operations												
53	Sinter Feed Transfer	P	9.64	6.26	192	50	0.7		Amb.	15	8160		
54	Sinter Screening	P	9.15	6.71	192	50	3.8		40	18	8160	3.08	
55	Sinter Exhaust	P	9.05	6.74	192	50	1.5		55	13	8160	3.08	Equiv. for 18 Stacks
56	Sinter Plant Fugitives	A	8.75	5.75	192			40			8160	3.08	
57	Sinter Transfer	P	9.37	6.18	192						8160	1.54	(Included w/ #10)
58	Sinter Transfer	P	9.40	5.92	192						8160	1.54	(Included w/ #11)

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner.

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18 1977
Page 4 of 5

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24 Hour Rates

I – EMISSION SOURCE DESCRIPTIONS

IRON AND STEELMAKING PROCESSES

Plant Source #	Operating Units/Facility (a)	Source Type Point/Area**	Location (U.S. Topographic Maps – UTM Coordinates)*		Base Elevation (m)	Stack(s)		Roof Monitor(s)	Exhaust		Operating Characteristics		
						Height (m)	Diam. (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr)	Quantity 10⁶ tonnes/yr	Other Characteristics
	Blast Furnace Operations												
59	Burden Transfer	P	9.45	6.07	192			60	Amb.		8400	6.70	
60	Burden Transfer	P	9.50	5.86	192			60	Amb.		8400	6.70	
61	Stockhouse Screen	P	9.54	5.96	192	30	0.85		Amb.	15	8400	6.70	
62	Stockhouse Screen	P	9.48	6.08	192	30	0.85		Amb.	15	8400	6.70	
63	Tapping	P	9.84	6.14	192	40	5.4		75	15	8400	3.25	
64	Tapping	P	9.86	6.13	192	40	5.4		75	15	8400	3.25	
65	Stove Exhaust	P	540.04	6.15	192	75	5.6		275	16.2	8760	3.25	
66	Stove Exhaust	P	9.77	6.07	192	75	5.6		275	16.2	8760	3.25	
67	Flare Stack	P	540.02	6.18	192	50	1.0		1200	15	80		Emergency Only
68	Flare Stack	P	9.75	6.11	192	50	1.0		1200	15	80		Emergency Only
69	BF Fugitives	A	9.75	5.75	192			50			8760	3.25	
70	BF Fugitives	A	9.75	5.75	192			50			8760	3.25	
71	Hot Metal DeSul	P	9.82	6.26	192	30	1.1		75	20	8760	6.50	
72	Hot Metal Mixer	P	9.79	6.30	192	30	5.2		75	15	8760	3.25	25% Operating Time
	Steelmaking Operations												
73	Hot Metal Charging				192						8760	6.80	Detailed in 78, 79, 80
74	Scrap Preparation	A	9.75	5.75	192				Amb		2000	1.00	
75A	Steelmaking Exhaust	P	9.71	6.47	192	75	3.0		1340	20	5870	2.27	Two of three on line
75B	Steel Tapping	P	9.71	6.47	192	75	3.0		45	15	5870	2.27	@ 20% of cycle time
76A	Steelmaking Exhaust	P	9.72	6.45	192	75	3.0		1340	20	5870	2.27	for steel making
76B	Steel Tapping	P	9.72	6.45	192	75	3.0		45	15	5870	2.27	and @ 20% of cycle time
77A	Steelmaking Exhaust	P	9.73	6.43	192	75	3.0		1340	20	5870	2.27	for tapping
77B	Steel Tapping	P	9.73	6.43	192	75	3.0		45	15	5870	2.27	
78	Hot Metal Charging	P	9.71	6.47	192	75	6.0		45	15	5870	2.27	Two of three on line
79	Hot Metal Charging	P	9.72	6.45	192	75	6.0		45	15	5870	2.27	at 10% of cycle time
80	Hot Metal Charging	P	9.73	6.43	192	75	6.0		45	15	5870	2.27	for charging
81	Steelmaking Fugitives	A	9.75	5.75	192			40			8760	6.80	

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*All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified

**All area sources are components of squares 1.0 Km on edge from coordinates for SW corner

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov. 18, 1977
I-Page 5 of 8

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24-Hour Rates

I – EMISSION SOURCE DESCRIPTIONS

STEEL WORKING PROCESSES & SUPPORTING OPERATIONS

Plant Source #	Operating Units/Facility (a)	Source Type Point/Area**	Location			Stack		Roof Monitor(s)	Exhaust		Operating Characteristics		
			U.S. Topographic Maps – UTM Coordinates*		Base Elevation (m)	Height (m)	Diam. (m)	Height (m)	Temp. (°C)	Velocity (m/sec)	Time (hours/yr.)	Quantity 10^6 tonnes/yr	Other Characteristics
	Continuous Casting Operations												
82	Teeming & Casting	A	8.75	5.75	182			45	45		8760	6.35	
83	Tundish Dumping/Cleaning	A	8.75	5.75	182	40	2.0	45	Amb.	15	730		Occurs 2 Hours Per Day
84	Argon Stirring	A	8.75	5.75	182			45	Amb.		8760	6.35	10% of Cycle Time
85	Slab Cutting	P	8.87	5.80	182					10	8760	6.35	Fumeless Burners
86	Spot Scarfing	P	540.82	6.81	182	30	1.5		95	10	8000		35% of Output
87	Machine Scarfing	P	8.95	6.60	182	30	2.5		95	16	1300		15% of Output
	Rolling Mill Operations												
89	Strip Reheat	P	540.10	6.72	182	50	6.0		780	18.7	8000	1.51	
90	Strip Reheat	P	540.13	6.73	182	50	6.0		780	18.7	8000	1.51	
91	Strip Reheat	P	540.16	6.76	182	50	6.0		780	18.7	8000	1.51	
93	Plate Reheat	P	540.18	6.43	182	30	4.4		780	15.7	7900	0.81	
94	Plate Reheat	P	540.24	6.46	182	30	4.4		780	15.7	7900	0.81	
95	Plate Cutting	A	8.75	5.75	182			25			7500	0.28	Fumeless Burners
96	Plate Normalizing	P	540.40	6.40	182	40	2.0		435	10.4	1500	0.22	
	Other Supporting Operations												
98	Boiler Exhaust	P	9.11	5.80	182	50	3.7		140	16.9	8760		
99	Boiler Exhaust	P	9.12	5.88	182	50	3.7		140	16.9	8760		
100	Boiler Exhaust	P	9.13	5.86	182	50	3.7		140	16.9	8760		
101	Boiler Exhaust	P	9.14	5.84	182	50	3.7		140	16.9	8760		
102	Boiler Exhaust	P	9.15	5.82	182	50	2.7		140	16.9	8760		
103A	Slag Processing Plant	P	540.86	4,848.00	182	30	1.8		Amb.	15	2000	1.00	
103B	Slag Processing Storage	A	540.75	4,845.50	182			25	Amb.		2000	1.00	
104	Solid Waste Disposal	A									2000		
105	Plant RR System	A									8760		36,000 mi./Yr
106	Plant Road System	A									8760		3,000 mi./Day

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* All UTM coordinates listed as 53X.XX/464X.XX Km, except as otherwise specified.

** All area sources are components of squares 1.0 Km on edge from coordinates for SW corner

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - 24 HOUR

Aug. 18 1977
II Page 1 of 5

H - FUEL UTILIZATION

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors 24 Hour Rates

Point Source #	Operating Units/Facility ID	Fuel Burning					Fuel Energy Demand (10⁶ Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Mm³/hr)	Coke Oven Gas (Mm³/hr)	B-BOF Gas (Mm³/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	B-BOF Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/hour)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Rate	
																	Parameter	Source
	Ore																	
1	Ore Unloading												-				(Included w/ #3)	
2	Ore Transfer												-				(Included w/ #3)	
3	Ore Stacking												Wet Spray			80	0.005 Kg/mt	AP-42
4	Ore Storage												Wet Spray			Total	Negligible	BACT
5	Ore Transfer												Baghouse	300	Amb	80	24 mg/Nm³	BACT
	Pellets																	
6	Pellet Unloading												-				Negligible	
7	Pellet Transfer												Wet Spray				Negligible	
8	Pellet Storage												-				Negligible	
9	Pellet Transfer												Baghouse	(Included w/ #5)				
10	Pellet Transfer												Baghouse	750	Amb		24 mg/Nm³	BACT
11	Pellet Transfer												Baghouse	350	Amb		24 mg/Nm³	BACT
	Limestone																	
12	Limestone Unloading												-				(Included w/ #13)	
13	Limestone Stacking												Wet Spray			80	0.005 Kg/mt	AP-42
14	Limestone Storage												Wet Spray			Total	Negligible	BACT
15	Limestone Transfer												Baghouse	(Included w/ #5)				
	Coal																	
16	Coal Dumping												Wet Spray			Total	Negligible	BACT
17	Blending and Storage												Wet Spray			Total	Negligible	BACT
18	Coal Transfer												Baghouse	(Included w/ #23)				

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
II Page 2 of 5

II – FUEL UTILIZATION

Plant Location Conneaut Ohio
Year of Data Base Year
Spread Factors 24 Hour Rates

Plant Source #	Operating Units/Facility (a)	Fuel Demand					Fuel Energy Demand (10^9 Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q-BOP Gas (Nm³/hr)	Oil (kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Rate Parameter	Source
	Lime Plant																	
19	Limestone Transfer												Baghouse	200	Amb	99	24 mg/Nm³	BACT
20	Lime Kiln Exhaust		10,400					45.6					Baghouse	1225	200	99	48 mg/Nm³	BACT
21	Lime Kiln Exhaust		10,400					45.6					Baghouse	1225	200	99	48 mg/Nm³	BACT
22	Lime Handling												Baghouse	1700	40	99	24 mg/Nm³	BACT
	Coke Plant Operations																	
23	Coal Crush and Mix												Baghouse	500	Amb	99	24 mg/Nm³	BACT
24	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm³	BACT
25	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm³	BACT
26	Coal Transfer												Baghouse	100	Amb	99	24 mg/Nm³	BACT
27	Coal Preheaters - S		[illegible]					48.9					Wet ESP	2x540	56		46 mg/Nm³ Wet Train	LAER
28	Coal Preheaters - N		[illegible]					48.9					Wet ESP	2x540	56		46 mg/Nm³ Wet Train	LAER
29	Coal Charge Bins - N												Wet ESP	2x700	55		46 mg/Nm³ Wet Train	LAER
30	Coal Charge Bins - S												Wet ESP	2x700	56		46 mg/Nm³ Wet Train	LAER
31	Coke Battery Charging															95	0.075 #/ton coal	AP-42
32	Coke Battery Charging															95	0.075 #/ton coal	AP-42
33	Coke Battery Charging															95	0.075 #/ton coal	AP-42
34	Coke Battery Charging															95	0.075 #/ton coal	AP-42
35	Coke Battery Pushing															90	0.08 #/ton coal	AP-42
36	Coke Battery Pushing															90	0.08 #/ton coal	AP-42
37	Coke Battery Pushing															90	0.08 #/ton coal	AP-42
38	Coke Battery Pushing															90	0.08 #/ton coal	AP-42
39	Coke Container Car												Scrubber	2400		99	0.03 lb/ton coke	LAER
40	Coke Container Car												Scrubber	2400		99	0.03 lb/ton coke	LAER

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

[illegible]
B - Page 3 of 6

B – [illegible]

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24 Hour Rates

Plant Source #	Operating Unit/Facility Id	[illegible]						[illegible]							Air Pollution Control Equipment					
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Type of Equipment	[illegible]	[illegible] (°F)	[illegible] (%)	Parameter	Source
	Coke Plant Operations (Cont.)																			
41	Coke Container Car														Scrubber	2400	Amb.	99	0.60 lb/ton Coke	LAER
42	Coke Container Car														Scrubber	2400	Amb.	99	0.60 lb/ton Coke	LAER
43	Quench Station – N														Baffled Tower		75		0.75 lb/ton Coke	LAER
44	Quench Station – S														Baffled Tower		75		0.75 lb/ton Coke	LAER
45	Coke Wharf Transfer														Baghouse	180	40	99	20mg/Nm^3	BACT
46	Crushing and Screening														Baghouse	480	Amb.	99	20mg/Nm^3	BACT
47	Crushing and Screening														Baghouse	480	Amb.	99	20mg/Nm^3	BACT
48	Coke Oven Stack	84,000	1700					48.9	7.6						Stack	2190	227		35 mg/Nm^3	LAER
49	Coke Oven Stack	84,000	1700					48.9	7.6						Stack	2190	227		35 mg/Nm^3	LAER
50	Coke Oven Stack	84,000	1700					48.9	7.6						Stack	2190	227		35 mg/Nm^3	LAER
51	Coke Oven Stack	84,000	1700					48.9	7.6						Stack	2190	227		35 mg/Nm^3	LAER
52	Coke Oven Fugitives																	99	0.01 lb/ton	AP-42
	Sinter Plant Operations																			
53	Sinter Feed Transfer														Baghouse	300	Amb.	99	20mg/Nm^3	BACT
54	Sinter Screening														Baghouse	10,000	40	99	20mg/Nm^3	BACT
55	Sinter Exhaust		8400				(34)		28.3				(247)		Cyclones and Wet ESP	23,500	36	99	40mg/Nm^3	LAER
56	Sinter Plant Fugitives																	99	0.07 lb/ton	AP-42
57	Sinter Transfer														Baghouse	(Included with #10)				
58	Sinter Transfer														Baghouse	(Included with #11)				

AD-A079 396 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY UNIT--ETC(U)
APR 79 P G LEUCHNER, G P KEPPEL

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Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
II Page 4 of 5

II – FUEL UTILIZATION

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24 Hour Rates

Plant Source #	Operating Units/Facility (s)	Fuel Demand					Fuel Energy Demand (10⁶ Kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm³/hr)	Coke Oven Gas (Nm³/hr)	Q–BOP Gas (Nm³/hr)	Oil (Kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm³/min)	Exit Temp (°C)	Control Efficiency (%)	Design Emission Basis	
																	Parameter	Source
	Blast Furnace Operations																	
59	Burden Transfer												Wet Spray			Total	Dust Suppression	
60	Burden Transfer												Wet Spray			Total	Dust Suppression	
61	Stockhouse Screen												Baghouse	500			24 mg/Nm³	BACT
62	Stockhouse Screen												Baghouse	500			24 mg/Nm³	BACT
63	Tapping												Baghouse	20,000		96	0.025 lb/ton *	BACT
64	Tapping												Baghouse	20,000		96	0.025 lb/ton *	BACT
65	Stove Exhaust	167,700	23,200				128.9	102.2					Stack				12 mg/Nm³ Fuel	BACT
66	Stove Exhaust	167,700	23,200				128.9	102.2					Stack				12 mg/Nm³ Fuel	BACT
67	Flare Stack												Flare Stack				12 mg/Nm³ Fuel	BACT
68	Flare Stack												Flare Stack				12 mg/Nm³ Fuel	BACT
69	BF Fugitives															95	0.025 lb/ton *	BACT
70	BF Fugitives															96	0.025 lb/ton *	BACT
71	Hot Metal DeSul												Baghouse	1,000			48 mg/Nm³	BACT
72	Hot Metal Mixer												Baghouse	6,700			48 mg/Nm³	BACT
	Steelmaking Operations																	
73	Hot Metal Charging																	
74	Scrap Preparation																	
75A	Steelmaking Exhaust												Hi Energy Scrubber	3,800		Total	36 mg/Nm³	BACT
75B	Steel Tapping		1,050					5.0					Hi Energy Scrubber	3,800		98	0.008 lb/Ton	BACT
76A	Steelmaking Exhaust												Hi Energy Scrubber	3,800		Total	36 mg/Nm³	BACT
76B	Steel Tapping		1,050					5.0					Hi Energy Scrubber	3,800		98	0.008 lb/Ton	BACT
77A	Steelmaking Exhaust												Hi Energy Scrubber	3,800		Total	36 mg/Nm³	BACT
77B	Steel Tapping												Hi Energy Scrubber	3,800		98	0.008 lb/Ton	BACT
78	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
79	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
80	Hot Metal Charging												Baghouse	25,000		98	0.01 lb/Ton	BACT
81	Steelmaking Fugitives															98		BACT

*Based on 0.5 lb/ton hot metal with capture of 95% and removal of 99%

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18 1977
II - Page 5 of 5

II – FUEL UTILIZATION

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Emission Factors: 24 Hour Rates

Plant Source #	Operating Unit/Facility (a)	Fuel Demand					Fuel Energy Demand (10^6 kcal/hr)						Air Pollution Control Equipment					
		Blast Furnace Gas (Nm^3/hr)	Coke Oven Gas (Nm^3/hr)	O-BOP Gas (Nm^3/hr)	Oil (kg/hr)	Coal (tonnes/hr)	Blast Furnace Gas	Coke Oven Gas	O-BOP Gas	Oil	Coal	Total	Type of Equipment	Rated Capacity (Nm^3/min)	Gas Temp (°C)	Control Efficiency (%)	Design Emission Rate	
																	Parameter	Source
	Continuing Casting Operations																	
82	Teeming & Casting		27,000					122.6					Process Control			80	0.015 lb/Ton Steel	
83	Tundish Dumping & Cleaning												Baghouse	2000	Amb		40 mg/Nm^3	BACT
84	Argon Stirring												Process Control				<100 mg/m Ton	
85	Slab Cutting																Negligible	
86	Spot Scarfing												Baghouse	1000	56	90	24 mg/Nm^3	BACT
87	Machine Scarfing												Wet ESP	2400	56	90	24 mg/Nm^3	BACT
	Rolling Mill Operations																BACT on Fuels	
89	Strip Reheat	8,650	11,200		3,100		8.7	48.9		32.4		90.0	Stack				BFG @ 12 mg/Nm^3	
90	Strip Reheat	8,650	11,200		3,100		8.7	48.9		32.4		90.0	Stack				COG @ 12 mg/Nm^3	
91	Strip Reheat	8,650	11,200		3,100		8.7	48.9		32.4		90.0	Stack				Oil @ 0.1 lb/MMBtu	
93	Plate Reheat	4,400	5,700		4,100		3.4	25.4		45.4		74.2	Stack					
94	Plate Reheat	4,400	5,700		4,100		3.4	25.4		45.4		74.2	Stack					
95	Plate Cutting																Negligible	
96	Plate Normalizing		6,400					29.8				29.8	Stack				COG @ 12 mg/Nm^3	BACT
	Other Supporting Operations																BACT on Fuels	
98	Boiler Exhaust	124,400		9100		5.74	96.6		18.2	41.5		156.3	ESP				BFG @ 12 mg/Nm^3	
99	Boiler Exhaust	124,400		9100		5.74	96.6		18.2	41.5		156.3	ESP				O-BG @ 36 mg/Nm^3	
100	Boiler Exhaust	124,000		9100		5.74	96.6		18.2	41.5		156.3	ESP				Coal @ 0.1 lb/MMBtu	
101	Boiler Exhaust	124,000		9100		5.74	96.6		18.2	41.5		156.3	ESP					
102	Boiler Exhaust	124,000		9100		5.74	96.6		18.2	41.5		156.3	ESP					
103A	Slag Processing Plant												Baghouse	500	Amb	80	24 mg/Nm^3	BACT
103B	Slag Processing Storage												Wet Spray			Total	Negligible	BACT
104	Solid Waste Disposal																	
105	Plant RR System																0.025 lb Gal	AP 42
106	Plant Road System																3 x 1.2 gm m.	AP 42

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Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977

III A – Page 1 of 5

III.A – GASEOUS EMISSIONS

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24-Hour Rates

Plant Source #	Operating Units/Facility (a)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Combined NO_x
	Ore																	
1	Ore Unloading																	
2	Ore Transfer																	
3	Ore Stacking																	
4	Ore Storage																	
5	Ore Transfer																	
	Pellets																	
6	Pellet Unloading																	
7	Pellet Transfer																	
8	Pellet Storage																	
9	Pellet Transfer																	
10	Pellet Transfer																	
11	Pellet Transfer																	
	Limestone																	
12	Limestone Unloading																	
13	Limestone Stacking																	
14	Limestone Storage																	
15	Limestone Transfer																	
	Coal																	
16	Coal Dumping																	
17	Blending and Storage																	
18	Coal Transfer																	

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - 24 HOUR

Nov 18, 1977
III A - Page 2 of 5

III.A. – GASEOUS EMISSIONS

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Factors 24 Hour Rates

Plant Source #	Operating Units/Facility (s)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined NO_x
	Lime Plant																	
19	Limestone Transfer																	
20	Lime Kiln Exhaust	16.6				16.6						24.2						10.1
21	Lime Kiln Exhaust	16.6				16.6						24.2						10.1
22	Lime Handling																	
	Coke Plant Operations																	
23	Coal Crush and Mix																	
24	Coal Transfer																	
25	Coal Transfer																	
26	Coal Transfer																	
27	Coal Preheaters - S	14.8				14.8												9.0
28	Coal Preheaters – N	14.8				14.8												9.0
29	Coal Charge Bins – N																	
30	Coal Charge Bins S																	
31	Coke Battery Charging					0.07						2.06						0.10
32	Coke Battery Charging					0.07						2.06						0.10
33	Coke Battery Charging					0.07						2.06						0.10
34	Coke Battery Charging					0.07						2.06						0.10
35	Coke Battery Pushing											0.48						
36	Coke Battery Pushing											0.48						
37	Coke Battery Pushing											0.48						
38	Coke Battery Pushing											0.48						
39	Coke Container Car																	
40	Coke Container Car																	

*SO_2 emissions decreased by 50% to 7.4 Kg/hr for each pair of preheaters due to use of wet ESP exhaust control system

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
III A – Page 3 of 5

III.A. – GASEOUS EMISSIONS

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24-Hour Rates

Plant Source #	Operating Units/Facility (a)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	O–BOP Gas	Oil	Coal	Combined NO_x
	Coke Plant Operations (Cont.)																	
41	Coke Container Car																	
42	Coke Container Car																	
43	Quench Station – N																	
44	Quench Station – S																	
45	Coke Wharf Transfer																	
46	Crushing and Screening																	
47	Crushing and Screening																	
48	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
49	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
50	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
51	Coke Oven Stack	2.7				2.7	17.7	0.5				18.2	62.4	1.7				64.1
52	Coke Oven Fugitives																	
	Sinter Plant Operations																	
53	Sinter Feed Transfer																	
54	Sinter Screening																	
55	Sinter Exhaust	(10.3)				258.6						11,400						267
56	Sinter Plant Fugitives																	
57	Sinter Transfer																	
58	Sinter Transfer																	

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
III.A. – Page 4 of 5

III.A. – GASEOUS EMISSIONS

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24-Hour Rates

Plant Source #	Operating Units/Facility (a)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	Q–BOP Gas	Oil	Coal	Combined NO_x
	Blast Furnace Operations																	
59	Burden Transfer																	
60	Burden Transfer																	
61	Stockhouse Screen																	
62	Stockhouse Screen																	
63	Tapping																	
64	Tapping																	
65	Stove Exhaust	38.9				38.9	46.8	6.3				52.1	181.6	22.4				184.0
66	Stove Exhaust	38.9				38.9	46.8	6.3				52.1	181.6	22.4				184.0
67	Flare Stack																	
68	Flare Stack																	
69	BF Fugitives																	
70	BF Fugitives																	
71	Hot Metal DeSul					2												
72	Hot Metal Mixer																	
	Steelmaking Operations																	
73	Hot Metal Charging																	
74	Scrap Preparation																	
75A	Steelmaking Exhaust																	
75B	Steel Tapping	1.7				1.7												
76A	Steelmaking Exhaust																	
76B	Steel Tapping	1.7				1.7												
77A	Steelmaking Exhaust																	
77B	Steel Tapping																	
78	Hot Metal Charging																	
79	Hot Metal Charging																	
80	Hot Metal Charging																	
81	Steelmaking Fugitives																	

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov 18, 1977
III.A. – Page 5 of 5

III.A. – GASEOUS EMISSIONS

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Factors: 24 Hour Rates

Plant Source #	Operating Units/Facility (a)	SO_2 Emissions (Kg/hr)					CO Emissions (Kg/hr)						NO_x Emissions (Kg/hr)					
		Coke Oven Gas	Oil	Coal	Other	Combined SO_2	Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Combined CO	BF Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Combined NO_x
	Continuing Casting Operations																	
82	Teeming & Casting	44.3				44.3		16.7				16.7		26.8				26.8
83	Tundish Dumping & Cleaning																	
84	Argon Stirring																	
85	Slab Cutting																	
86	Spot Scarfing																	
87	Machine Scarfing																	
	Rolling Mill Operations																	
89	Strip Reheat	17.7	70.0			87.7	2.3	3.1		1.5		6.9	8.4	10.8		22.9		42.1
90	Strip Reheat	17.7	70.0			87.7	2.3	3.1		1.5		6.9	8.4	10.8		22.9		42.1
91	Strip Reheat	17.7	70.0			87.7	2.3	3.1		1.5		6.9	8.4	10.8		22.9		42.1
93	Plate Reheat	9.2	98.4			107.6	1.2	1.6		2.2		5.0	4.2	5.5		32.4		42.1
94	Plate Reheat	9.2	98.4			107.6	1.2	1.6		2.2		5.0	4.2	5.5		32.4		42.1
95	Plate Cutting																	
96	Plate Normalizing	10.5				10.5		1.8				1.8		6.2				6.2
	Other Supporting Operations																	
98	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	39.4	2.3	2.9	2.9		16.1	21.3
99	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	39.4	2.3	2.9	2.9		16.1	21.3
100	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	39.4	2.3	2.9	2.9		16.1	21.3
101	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	39.4	2.3	2.9	2.9		16.1	21.3
102	Boiler Exhaust			89.8		89.8	34.0		2.5		2.9	39.4	2.3	2.9	2.9		16.1	21.3
103A	Slag Processing Plant																	
103B	Slag Processing Storage																	
104	Solid Waste Disposal																	
105	Plant RR System																	
106	Plant Road System																	

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Nov. 18, 1977
III.B. & III.C. – Page 1 of 5

Plant Location Conneaut, Ohio
Year of Data Base Year
Special Feature 24 Hour Rates

III.B. – GASEOUS EMISSIONS (CONT.)

Plant Source #	Emitting Units/Facility (a)	Hydrocarbons (kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	Gaseous Hydrocarbons
	Ore						
1	Ore Unloading						
2	Ore Transfer						
3	Ore Stacking						
4	Ore Storage						
5	Ore Transfer						
	Pellets						
6	Pellet Unloading						
7	Pellet Transfer						
8	Pellet Storage						
9	Pellet Transfer						
10	Pellet Transfer						
11	Pellet Transfer						
	Limestone						
12	Limestone Unloading						
13	Limestone Stacking						
14	Limestone Storage						
15	Limestone Transfer						
	Coal						
16	Coal Dumping						
17	Blending and Storage						
18	Coal Transfer						

III.C. – PARTICULATE EMISSIONS

Plant Source #	Emitting Units/Facility (a)	Fuel Use Particulate Emissions (kg/hr)						Process Emissions (kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rate of Generation	Controlled Emissions	Fugitive Emissions
	Ore									
1	Ore Unloading							-		-
2	Ore Transfer							-		-
3	Ore Stacking							2.0		2.0
4	Ore Storage									Negligible
5	Ore Transfer							-	0.42	
	Pellets									
6	Pellet Unloading							-		-
7	Pellet Transfer							-		-
8	Pellet Storage							-		-
9	Pellet Transfer							(Included w/ #5)		
10	Pellet Transfer								0.36	
11	Pellet Transfer								0.50	
	Limestone									
12	Limestone Unloading							-		-
13	Limestone Stacking							1.0		1.0
14	Limestone Storage									Negligible
15	Limestone Transfer							(Included w/ #5)		
	Coal									
16	Coal Dumping							-		Negligible
17	Blending and Storage									Negligible
18	Coal Transfer							(Included w/ #23)		

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - 24 HOUR

Nov. 18 1977
III B & III C Page 2 of 5

Plant Location: Conneaut Ohio
Year of Data: Base Year
Special Feature: 24 Hour Rat[illegible]

III-B. - GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	[illegible] Hydrocarbons
	Lime Plant						
19	Limestone Transfer						
20	Lime Kiln Exhaust						
21	Lime Kiln Exhaust						
22	Lime Handling						
	Coke Plant Operations						
23	Coal Crush and Mix						
24	Coal Transfer						
25	Coal Transfer						
26	Coal Transfer						
27	Coal Preheaters - S						Negligible
28	Coal Preheaters - N						Negligible
29	Coal Charge Bins - N						Negligible
30	Coal Charge Bins - S						Negligible
31	Coke Battery Charging						8.6
32	Coke Battery Charging						8.6
33	Coke Battery Charging						8.6
34	Coke Battery Charging						8.6
35	Coke Battery Pushing						1.4
36	Coke Battery Pushing						[illegible]
37	Coke Battery Pushing						1.4
38	Coke Battery Pushing						1.4
39	Coke Container Car						
40	Coke Container Car						

III-C - PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	[illegible]	Controlled Emissions	Fugitive Emissions
	Lime Plant									
19	Limestone Transfer								0.3	
20	Lime Kiln Exhaust								3.6	
21	Lime Kiln Exhaust								3.6	
22	Lime Handling								2.5	
	Coke Plant Operations									
23	Coal Crush and Mix								0.7	
24	Coal Transfer								0.15	
25	Coal Transfer								0.15	
26	Coal Transfer								0.15	
27	Coal Preheaters S								3.1	
28	Coal Preheaters N								3.1	
29	Coal Charge Bins N								1.0	
30	Coal Charge Bins S								1.0	
31	Coke Battery Charging									5.1
32	Coke Battery Charging									5.1
33	Coke Battery Charging									5.1
34	Coke Battery Charging									5.1
35	Coke Battery Pushing									2.0
36	Coke Battery Pushing									2.0
37	Coke Battery Pushing									2.0
38	Coke Battery Pushing									2.0
39	Coke Container Car								1.4	[illegible]
40	Coke Container Car								1.0	[illegible]

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

III B & III C – Page 3 of 5

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Special Feature: 24 Hour Rates

III–B. – GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	[illegible] Hydrocarbons
	Coke Plant Operations (Cont.)						
41	Coke Container Car						
42	Coke Container Car						
43	Quench Station – N						
44	Quench Station – S						
45	Coke Wharf Transfer						
46	Crushing and Screening						
47	Crushing and Screening						
48	Coke Oven Stack	3.1		0.1			3.3
49	Coke Oven Stack	3.1		0.1			3.3
50	Coke Oven Stack	3.1		0.1			3.3
51	Coke Oven Stack	3.1		0.1			3.3
52	Coke Oven Fugitives						
	Sinter Plant Operations						
53	Sinter Feed Transfer						
54	Sinter Screening						
55	Sinter Exhaust						24.3
56	Sinter Plant Fugitives						
57	Sinter Transfer						
58	Sinter Transfer						

III–C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	Point of Generation	Controlled Emissions	Fugitive Emissions
	Coke Plant Operations (Cont.)									
41	Coke Container Car								1.4	Treated as Fugitives
42	Coke Container Car								1.4	Treated as Fugitives
43	Quench Station – N								23.2	
44	Quench Station – S								23.2	
45	Coke Wharf Transfer								0.16	
46	Crushing and Screening								0.7	
47	Crushing and Screening								0.7	
48	Coke Oven Stack								4.7	
49	Coke Oven Stack								4.7	
50	Coke Oven Stack								4.7	
51	Coke Oven Stack								4.7	
52	Coke Oven Fugitives									1.9
	Sinter Plant Operations									
53	Sinter Feed Transfer								0.46	
54	Sinter Screening								15.5	
55	Sinter Exhaust								72.3	
56	Sinter Plant Fugitives									14.7
57	Sinter Transfer							Included w/ #109		
58	Sinter Transfer							Included w/ #111		

Table 1-24 (Continued)

UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES - 24 HOUR

III B & III C Page 4 of 5

Plant Location Conneaut, Ohio
Year of Data Base Year
[illegible] Factors 24 Hr - Basis

III B. - GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facility (a)	Hydrocarbons (Kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Blast Furnace Operations						
59	Burden Transfer						
60	Burden Transfer						
61	Stockhouse Screen						
62	Stockhouse Screen						
63	Tapping						
64	Tapping						
65	Stove Exhaust	8.1		1.2			9.2
66	Stove Exhaust	8.1		1.2			9.2
67	Flare Stack						
68	Flare Stack						
69	BF Fugitives						
70	BF Fugitives						
71	Hot Metal DeSul						
72	Hot Metal Mixer						
	Steelmaking Operations						
73	Hot Metal Charging						
74	Scrap Preparation						
75A	Steelmaking Exhaust						
75B	Steel Tapping						
76A	Steelmaking Exhaust						
76B	Steel Tapping						
77A	Steelmaking Exhaust						
77B	Steel Tapping						
78	Hot Metal Charging						
79	Hot Metal Charging						
80	Hot Metal Charging						
81	Steelmaking Fugitives						

III C. - PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facility (a)	Fuel Use Particulate Emissions (Kg/hr)						Process Emissions (Kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rate of Generation	Controlled Emissions	Fugitive Emissions
	Blast Furnace Operations									
59	Burden Transfer									
60	Burden Transfer									
61	Stockhouse Screen								0.7	
62	Stockhouse Screen								0.7	
63	Tapping								7.08	
64	Tapping								7.08	
65	Stove Exhaust	2.0	0.3				2.3		2.3	
66	Stove Exhaust	2.0	0.3				2.3		2.3	
67	Flare Stack									Emergency Only
68	Flare Stack									Emergency Only
69	BF Fugitives									4.6 @ 50%
70	BF Fugitives									4.6 @ 50%
71	Hot Metal DeSul								2.8	
72	Hot Metal Mixer								4.8	
	Steelmaking Operations									
73	Hot Metal Charging									
74	Scrap Preparation									
75A	Steelmaking Exhaust								1.50	[illegible]
75B	Steel Tapping								0.60	
76A	Steelmaking Exhaust								1.50	
76B	Steel Tapping								0.60	
77A	Steelmaking Exhaust									
77B	Steel Tapping									
78	Hot Metal Charging								0.9	[illegible]
79	Hot Metal Charging								0.9	
80	Hot Metal Charging									
81	Steelmaking Fugitives									6.0 @ 50%

Table 1-24 (Continued)

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UNITED STATES STEEL CORPORATION
PROPOSED STEEL PLANT AIR EMISSIONS INVENTORY SOURCES – 24 HOUR

Plant Location: Conneaut, Ohio
Year of Data: Base Year
Seasonal Pattern: 24 Hour Rates

III.B. – GASEOUS EMISSIONS (CONT.)

Plant Source #	Operating Units/Facilities (a)	Hydrocarbons (kg/hr)					
		Blast Furnace Gas	Q-BOP Gas	Coke Oven Gas	Oil	Coal	Combined Hydrocarbons
	Continuing Casting Operations						
82	Teeming & Casting			1.4			1.4
83	Tundish Dumping & Cleaning						
84	Argon Stirring						
85	Slab Cutting						
86	Spot Scarfing						
87	Machine Scarfing						
	Rolling Mill Operations						
89	Strip Reheat	0.41		0.53			1.7
90	Strip Reheat	0.41		0.53			1.7
91	Strip Reheat	0.41		0.53			1.7
93	Plate Reheat	0.22		0.28			2.1
94	Plate Reheat	0.22		0.28			2.1
95	Plate Cutting						
96	Plate Normalizing			0.30			
	Other Supporting Operations						
98	Boiler Exhaust	5.88	0.4			0.87	7.3
99	Boiler Exhaust	5.98	0.4			0.87	7.3
100	Boiler Exhaust	5.88	0.4			0.87	7.3
101	Boiler Exhaust	5.98	0.4			0.87	7.2
102	Boiler Exhaust	5.90	0.4			0.87	7.3
103A	Slag Processing Plant						
103B	Slag Processing Storage						
104	Solid Waste Disposal						
105	Plant RR System						
106	Plant Road System						

*Max 15.9 kg/hr on Oil
**Max 13.4 kg/hr on Oil
***Four out of five on line at five on-line at 80% rate. maximum emission on coal only in emergency = 28 kg/hour/boiler on 4 boilers.

Source: United States Steel Corporation, Arthur D. Little, Inc.

III.C. – PARTICULATE EMISSIONS

Plant Source #	Operating Units/Facilities (a)	Fuel Use Particulate Emissions (kg/hr)						Process Emissions (kg/hr)		
		Blast Furnace Gas	Coke Oven Gas	Q-BOP Gas	Oil	Coal	Particulates From Fuel Use	Rate of Generation	Controlled Emissions	Fugitive Emissions
	Continuing Casting Operations									
82	Teeming & Casting						0.33		0.33	5.8 @ 50%
83	Tundish Dumping & Cleaning								0.63	Negligible
84	Argon Stirring									0.1 @ 50%
85	Slab Cutting									
86	Spot Scarfing								1.57	
87	Machine Scarfing								3.90	
	Rolling Mill Operations									
89	Strip Reheat	0.11	0.13		5.94				8.1 *	
90	Strip Reheat	0.11	0.13		5.94				8.1 *	
91	Strip Reheat	0.11	0.13		5.94				8.1 *	
93	Plate Reheat	0.08	0.07		8.2				6.2 **	
94	Plate Reheat	0.06	0.07		5.3				5.3 **	
95	Plate Cutting									
96	Plate Normalizing		0.08						0.08	
	Other Supporting Operations									
98	Boiler Exhaust	1.5		0.3		7.5			9.3 ***	
99	Boiler Exhaust	1.5		0.2		7.5			9.3 ***	
100	Boiler Exhaust	1.5		0.3		7.5			9.3 ***	
101	Boiler Exhaust	1.5		0.3		7.5			9.2 ***	
102	Boiler Exhaust	1.5		0.2		7.5			9.3 ***	
103A	Slag Processing Plant								0.7	
103B	Slag Processing Storage									Negligible
104	Solid Waste Disposal									Negligible
105	Plant RR System									0.5
106	Plant Road System									0.45

Table 1-25

Plant Process Wastewater Discharge Requirements Based on Tentative EPA Effluent Guidelines (1)

Daily Average Effluent Limitations

Facility	Maximum Daily Production Rate (English tons/day)	Cyanide (A)[3]		Phenol		Ammonia		Sulfide		Oil & Grease		TSS		Fluoride	
		(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)	(lbs/ton)	(lbs/day)
Coke Plant[2]	10,000	0.00039	3.9	.00082	8.2	0.0164	164	0.00019	1.9	0.0164	164	0.0406	406	-	-
Sinter Plant	11,500	-	-	-	-	-	-	0.0001	1.45	0.0083	96	0.0208	239	0.0166	191
Blast Furnace	22,500	0.00026	5.85	0.00052	11.7	0.0104	234	0.00032	7.2	-	-	0.026	585	0.0208	468
Steel Making	23,600	-	-	-	-	-	-	-	-	-	-	0.0104	245	0.0084	198
Continuous Caster	22,000	-	-	-	-	-	-	-	-	0.0104	229	0.0104	229	0.0084	185
Hot Stop Mill	22,000	-	-	-	-	-	-	-	-	0.0115	253	0.0115	254	-	-
Plate Mill	6,000	-	-	-	-	-	-	-	-	0.0125	76	0.0125	75	-	-
Total Process Waste Load =		-	9.75	-	19.9	-	398	-	10.55	-	818	-	2036	-	1042

(1) The above tentative effluent guidelines are based on a letter of transmittal from USEPA Region V Administrator to the United States Steel Corporation dated 5 August 1977, and in no way represents actual discharge permit requirements which will be determined at a later date.

(2) The guidelines for the coke plant include a 25% allowance because gas desulfurization is employed and a 70% allowance because of indirect ammonia recovery.

(3) Cyanide (A) - cyanide which is in a form suitable for chemical reaction by alkaline chlorination.

Table 1-26

Projected Lake Front Wastewater Effluent Quality(1)

	(Lbs/Day)
Cyanide (A)(2)	9.75
Phenol	19.9
Ammonia	525
Sulfide	14.55
Oil & Grease	818
Total Suspended Solids	2034
Fluoride	857
Total Cyanide(3)	72.3

---

(1) All waste loadings present long-term averages based on maximum plant production rate. (Calculated from EPA BAT limits.)

(2) Cyanide (A) - cyanide which is in a form suitable for chemical reaction by alkaline chlorination.

(3) Calculated from United States Steel Corporation data.

Wastewater Treatment Systems

1.297
The projected size and composition of the wastewater streams and the methods selected for their treatment are based largely on U.S. Steel Corporation's operating experience at existing plants. Many of the estimates of the wastewater flow rates and treated effluent compositions are based on the U.S. Steel Fairfield Works in Fairfield, Alabama, which is an integrated facility capable of producing approximately 3.2 million tonnes (3.5 million tons) of steel per year. The Fairfield Works recycles more than 95 percent of its water and combines its wastewater streams into a single discharge point. Some of the wastewater flow rates and effluent compositions are based on the wastewater systems at other U. S. Steel facilities, while the blast furnace projections are based on pilot work presently underway within U. S. Steel.

a) Overall Water Usage

1.298
The applicant estimates that the proposed facilities will require a total water circulation rate of approximately 185,000 m^3/hr (814,600 gpm) under maximum operating conditions. The three main categories of water usage and estimated percent of total usage are (1) closed system cooling -- 12 percent, (2) indirect system cooling -- 48 percent, and (3) process water -- 40 percent. A high percentage of the water is recycled thereby sharply reducing both the overall plant water supply requirements and the size of the wastewater discharge. The plant will require a raw water intake of 14,800 m^3/hr (65,200 gpm), which is about eight percent of the total water circulation rate. Closed system cooling is used for boiler feed systems where high water quality is required for efficient operation. Generally cooling is accomplished by condenser systems rather than direct usage of cooling towers. Water is periodically blown down from this system to maintain water quality and control dissolved solids levels. Indirect or non-contact cooling water (defined as water used as a heat exchange medium in a system where there is no direct contact between the water and product, byproduct, or waste streams) is recirculated through a number of cooling towers which remove heat from the water by convective and evaporative cooling. The amount of cooling water expected to be lost through evaporation and drift (entrained water particles carried into the air stream) is 3,700 m^3/hr (16,300 gpm). A portion of the cooling water recirculating stream must be purged as "blowdown" from the cooling water circuit in order to prevent the dissolved minerals originally present in the inlet water from building up to undesirable levels. The total plant wastewater discharge at maximum production will be 11,100 m^3/hr (48,800 gpm). Of this amount, 40 percent or

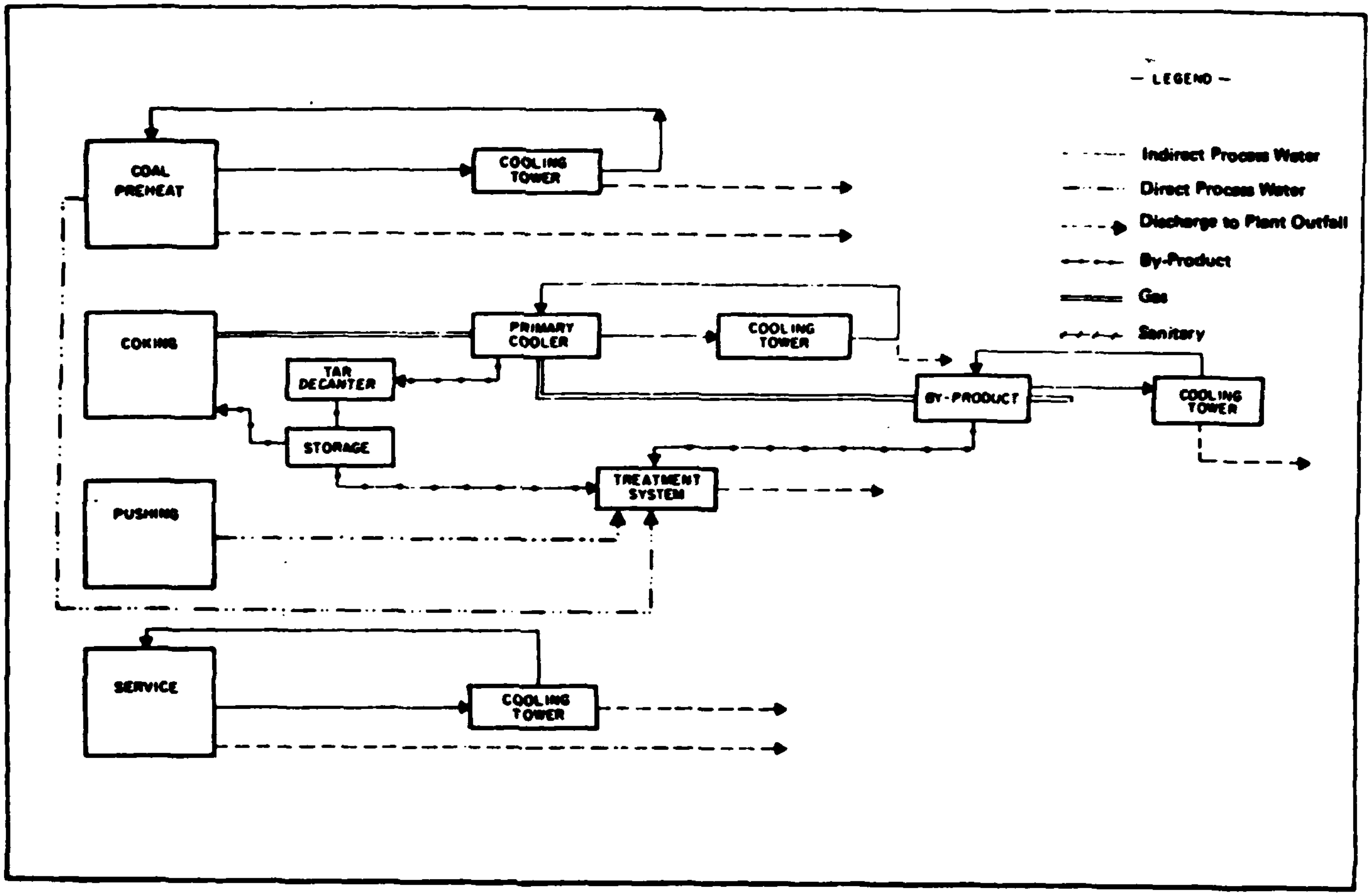
4,400 m^3/hr (19,400 gp) will consist of treated process wastewater, and 60 percent or 6,700 m^3/hr (29,400 gpm) will consist of cooling tower blowdown. The process water discharge flow rate includes approximately 500 m^3/hr (2,200 gpm) of once-through service water such as drinking water, treated sanitary sewage, and various other service type discharges. In addition to the above, the wastewater stream will also include some storm-water runoff collection from the plant site. Although stormwater inputs are intermittent, their contribution could be significant depending on area rainfall events and other factors. The origin, size, characteristics, and intended method of treatment of the wastewater streams from the various plant operations are described in the following sections.

b) Coke Plant

1.299
In the cokemaking operation, there are four activities which generate wastewater streams as shown in Figure 1-15. These include (1) coal preheating, (2) the COG handling and byproduct operations, (3) the oven pushing and coke quenching operations, and (4) the coke plant utility or "service" facilities.

1.300
In coal preheating, indirect cooling water is used to cool equipment number of cooling towers. A portion of the circulating cooling water is purged from the cooling circuit and discharged through the main plant outfall. In addition to the blowdown from the indirect cooling system, the coal preheating operation also utilizes and discharges (through the plant outfall) a relatively small quantity of miscellaneous once-through service water that is necessary for maintenance of the operation.

1.301
In the COG handling process, primary gas cooling is accomplished in an indirect cooling system which utilizes a cooling tower. A portion of the circulating cooling water is purged from the cooling circuit and discharged as blowdown to prevent the buildup of dissolved solids. Process wastewater from coke byproduct recovery operations consist of the following: (1) excess flushing liquor resulting from the moisture contained in the coal, and which is volatilized with the COG and then condensed from the latter during the primary cooling step, (2) steam condensate from light oil distillation, (3) blowdown from the final gas cooler system, (4) blowdown from the "Phos-Am" ammonia recovery system, and (5) miscellaneous water such as leakage and washdown. Wastewater streams from these process units are combined into a single stream and then sent to a wastewater treatment facility that is used solely for treating the coke plant wastewater. The U.S. Environmental Protection Agency (EPA) has set guidelines



Source: United States Steel Corporation.

Figure 1-15 FLOW DIAGRAM SHOWING WASTEWATER STREAMS GENERATED IN THE COKEMAKING PROCESS

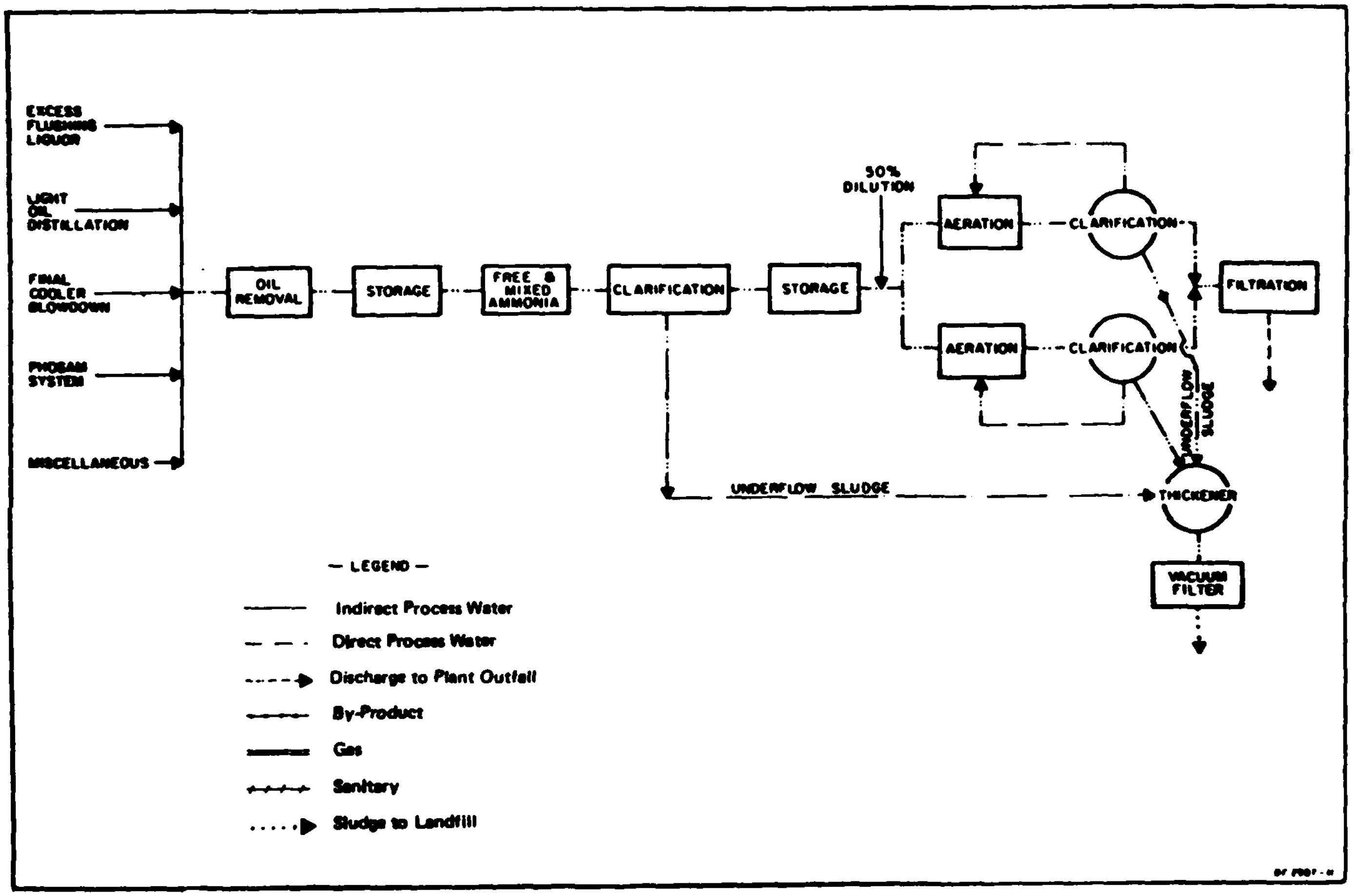
for pollutants contained in coke plant wastewater, namely, suspended solids, oil and grease, ammonia, phenol, sulfide, and cyanide (A) (cyanide in a form which is amenable to destruction by alkaline chlorination). The applicant's coke plant wastewater treatment system is intended to effect significant reductions in all of the above wastewater parameters and is shown schematically in Figure 1-16.

1.302

The coke plant wastewater treatment for the Conneaut plant system will be similar to the ones currently in operation at U.S. Steel's Fairfield and Clairton Works and at National Steel's Brown's Island plant. The system for the proposed plant would include a primary oil removal step, storage capacity for equalization of the waste loads, free and fixed ammonia stills, clarification for suspended solids removal, additional flow equalization, and after clarification, the still underflow will be diluted by a factor of 1.5 before passing to biological treatment. This has been found necessary for the proper operation of the biological system. Biological treatment in the form of an activated sludge system is equipped with clarification and sludge recycle, plus filtration for the final removal of supended solids. The total treated wastewater flow rate will be 237 m^3/hr (1,040 gpm), which is equivalent to 1.6m^3/tonne (150 gallons per ton) of coke. The biological treatment portion of the overall coke plant wastewater treatment facility is primarily designed for the removal of phenols, cyanide, oil and grease, sulfide and other sulfur compounds, and dissolved organic matter. It is anticipated that the bulk of the ammonia will be removed by the free and fixed ammonia stills rather than by being converted to nitrate in the biological treatment system. Although some ammonia may be going into the biological treatment system and be oxidized to nitrate, the biological treatment system is not designed to effect a significant degree of nitrification, consequently, nitrate levels in the effluent are not expected to be high. Phosphate from the Phos-Am ammonia recovery system present in the raw wastewater effluent should be sufficient to meet the needs of bacteriological microorganisms in the biological treatment system. However, if the phosphorous levels are too low, concentrations will be increased through the addition of phosphoric acid. Most of the phosphorous in the raw wastewater is taken up by the microorganisms and will, therefore, not appear in the effluent. Air emissions during the pushing of hot product coke from the ovens will be controlled by moveable hooding over the hot coke cars with cleaning of the off-gases through a fixed duct to a wet scrubber. It is planned to dispose of this water by treating it in the coke plant wastewater treatment system.

1.303

Other sources of wastewater in the coke plant occur in the utility, or service area. Here there will be a blowdown of uncontaminated



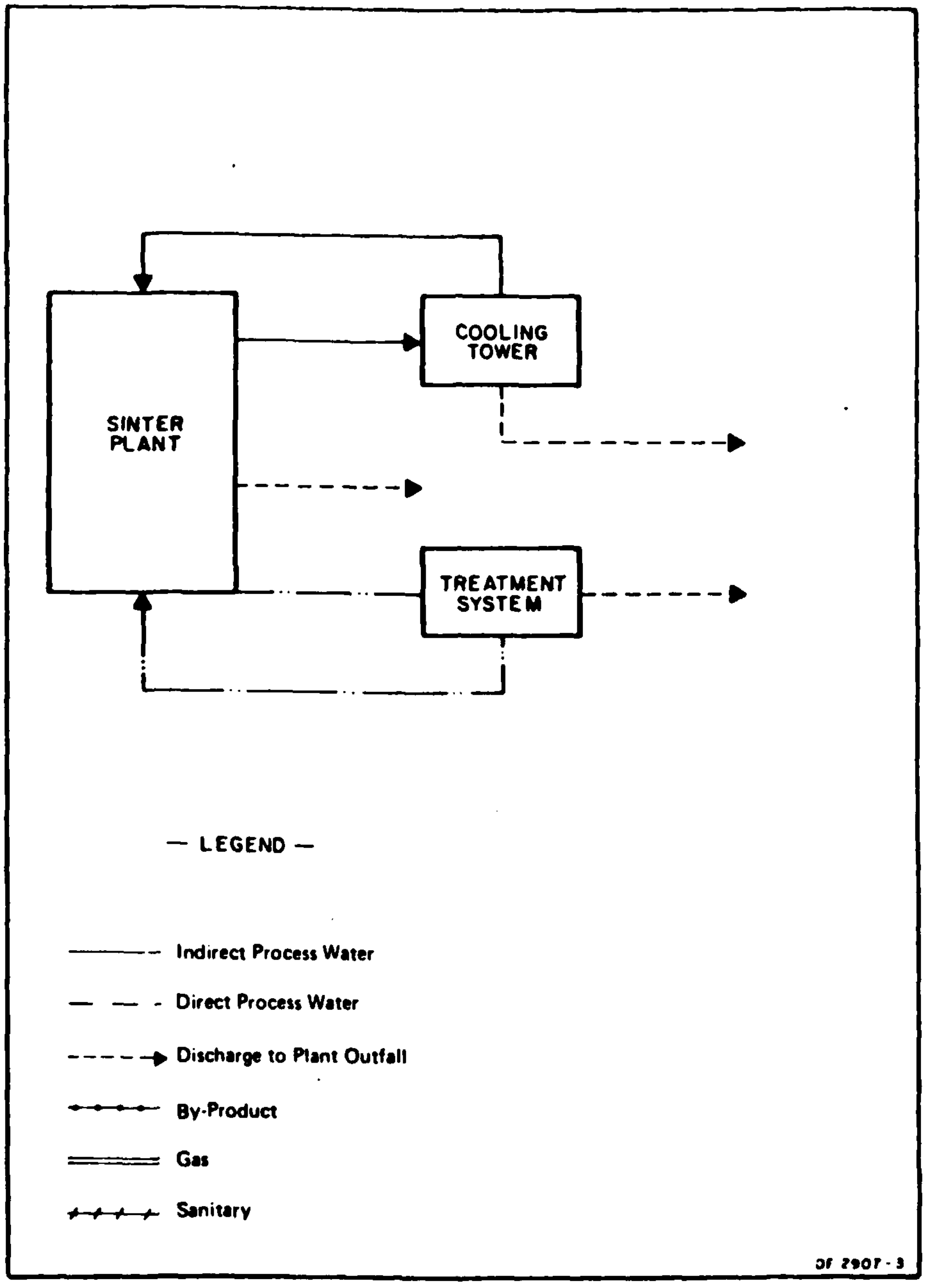
Source: United States Steel Corporation.

Figure 1-16 FLOW DIAGRAM OF COKE PLANT WASTEWATER TREATMENT SYSTEM

cooling water from the equipment cooling system and also a relatively small discharge of boiler blowdown and water softener backwash from the boilers that supply steam for driving the COG exhausters. These streams will contain moderate amounts of dissolved inorganic salts and will be discharged untreated into the central wastewater collection system.

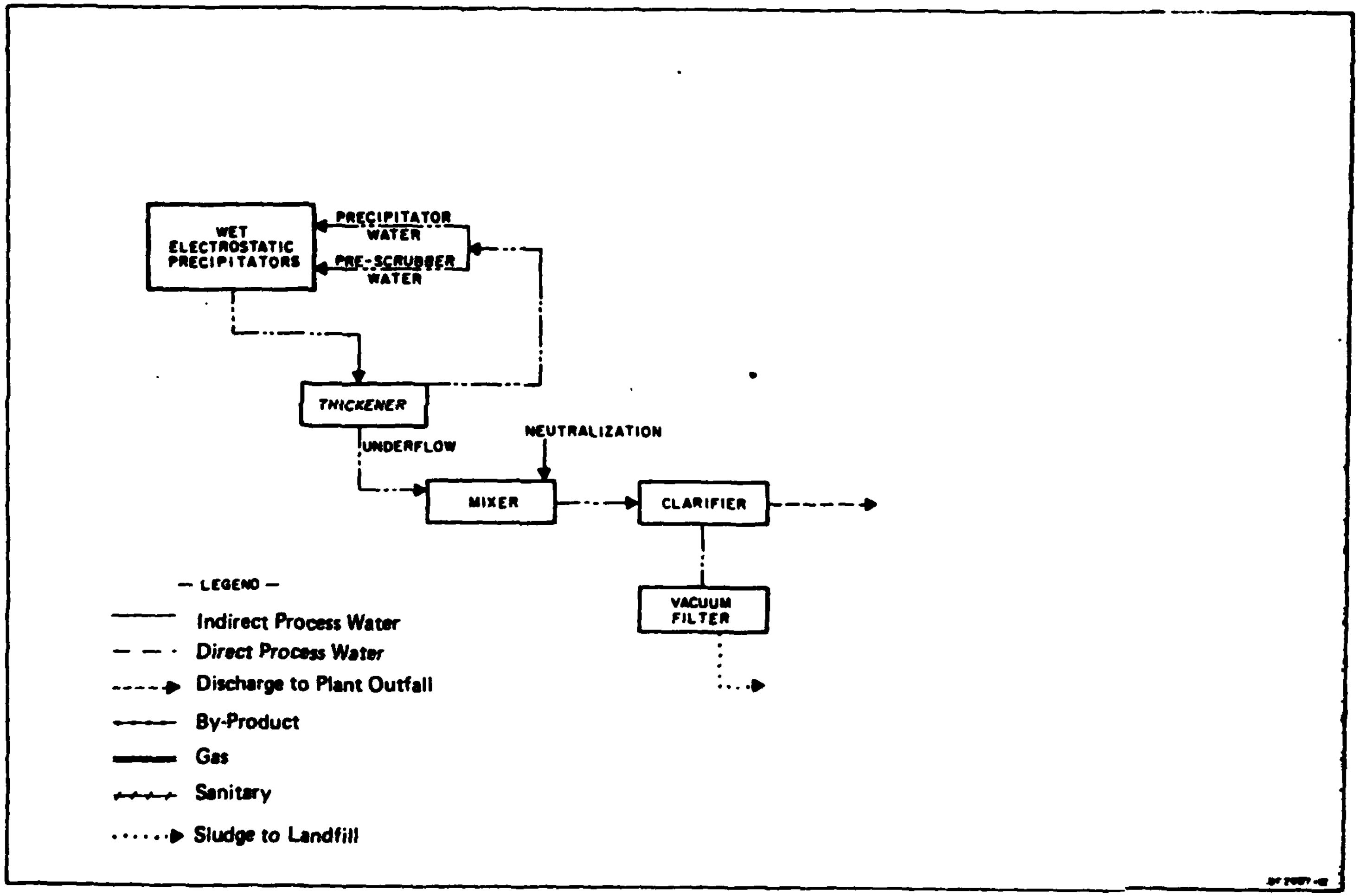
c) Sinter Plant

1.304
The sinter plant, as shown in Figure 1-17, generates three wastewater streams: (1) blowdown from the indirect cooling water system, (2) a small volume of miscellaneous service water, and (3) process wastewater from the windbox exhaust gas cleaning system. The applicant has had success with wet electrostatic precipitators at a number of hot scarfer installations where the particulate fume to be cleaned is of a much smaller particle size than found in sinter emissions. Based on this experience, wet electrostatic precipitators will be installed for cleaning sinter plants windbox exhaust gases, with a relatively low expenditure of energy. Much of the water required in this type of device will be recycled after primary clarification, but a portion must be discharged as blowdown to maintain the dissolved solids concentration at an acceptable level. The recycle water will exhibit low pH values due to entrainment of sulfur oxides during gas cleaning. Accordingly, the precipitator system must be constructed of materials that resist corrosion by the low pH water. This blowdown will be treated prior to discharge in order to control pH and to remove suspended solids as well as oil and grease. Since fluorspar (calcium fluoride) will not be used as a fluxing agent in either the blast furnace or the steelmaking operations, it is expected that no fluoride will be present in the effluent from the sinter plant. However, the presence of trace levels of fluoride in the limestone used as a fluxing agent may result in detectable levels of fluoride in sinter plant effluents. The sinter plant wastewater treatment system is shown in Figure 1-18. Raw wastewater from the electrostatic precipitator is first sent to a thickener where the heavier suspended solids are removed. The partially clarified water is then recycled back to the electrostatic precipitator while the thickener underflow, which contains the bulk of suspended solids, is subjected to further treatment consisting of neutralization and final clarification. The sludge removed from the final clarifier is dewatered by vacuum filtration prior to disposal into a landfill. Utilizing limited data available on sinter plant wet scrubber systems and from an experimental wet precipitator installation used by another steel company, the applicant estmates that the sinter plant treated wastewatr flow rate will be 270 m^3/hr, (1,190 gpm). This is equivalent to 1.6 m^3/tonne (150 gallons per ton) of sinter.



Source: United States Steel Corporation.

Figure 1-17 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE SINTER PLANT



Source: United States Steel Corporation.

Figure 1-18 FLOW DIAGRAM OF SINTER PLANT WASTEWATER TREATMEN

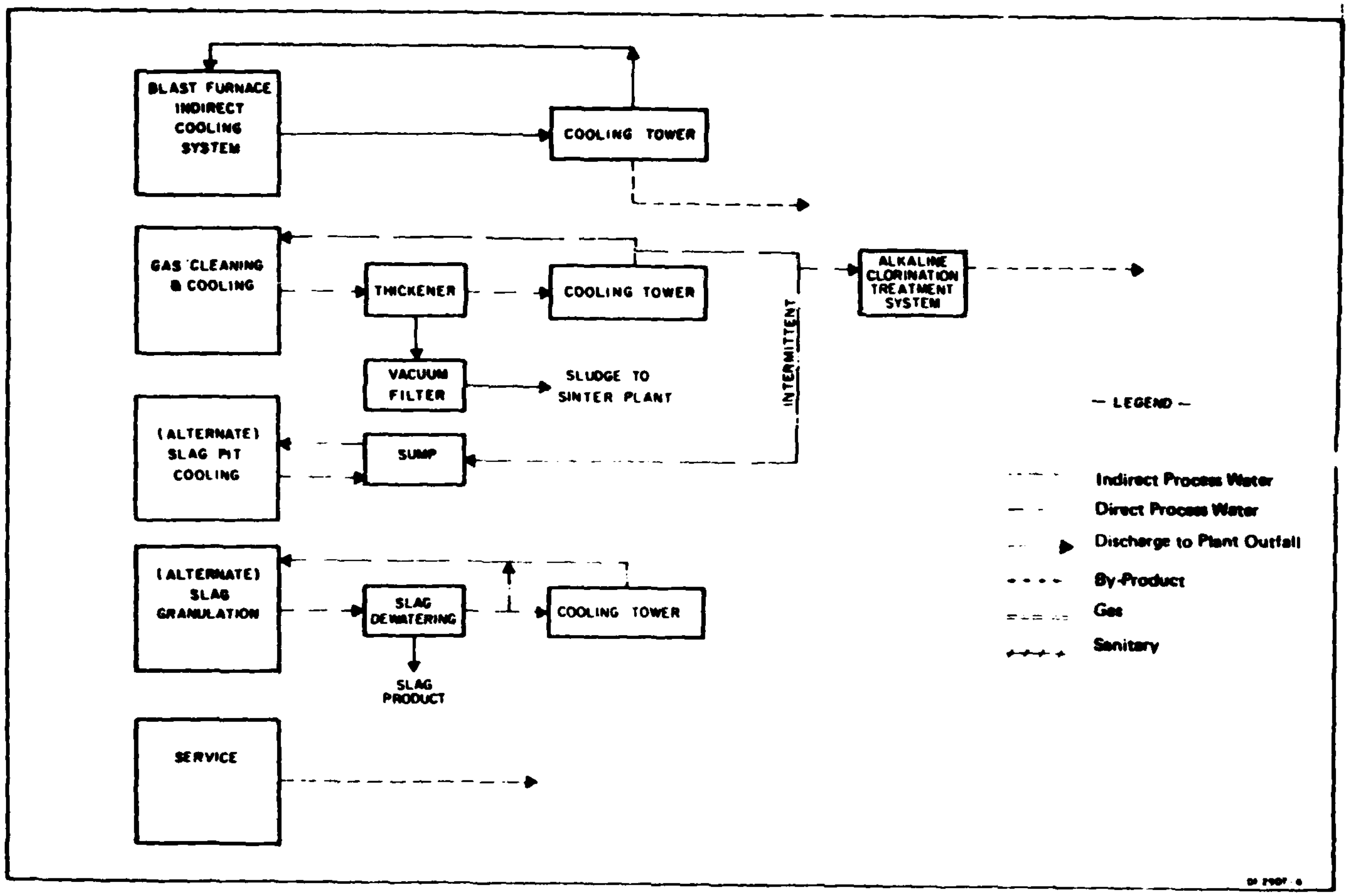
d) Blast Furnaces

1.305
As shown in Figure 1-19, the blast furnaces generate four different wastewater streams: (1) blowdown from the indirect cooling system for the blast furnaces and related auxiliaries, (2) wastewater from slag cooling, (3) miscellaneous service and maintenance water, and (4) wastewater from blast furnace gas cooling and cleaning.

1.306
The blowdown from the indirect cooling system will not be contaminated with chemical additives and will be discharged without treatment. Two options are available for the cooling of slag. The normal practice will be slag granulation by water jets. In granulation of the molten slag, the water used will be contained in a closed loop with no discharge from the plant. The second method involves utilization of "dry" slag beds near the furnaces for production of a hard slag product. The cooling water for this system also will be contained in a closed loop and recycled, so that there will be no discharge from the plant. The miscellaneous service and maintenance water will be small in volume, containing mostly suspended solids, and will be discharged without treatment.

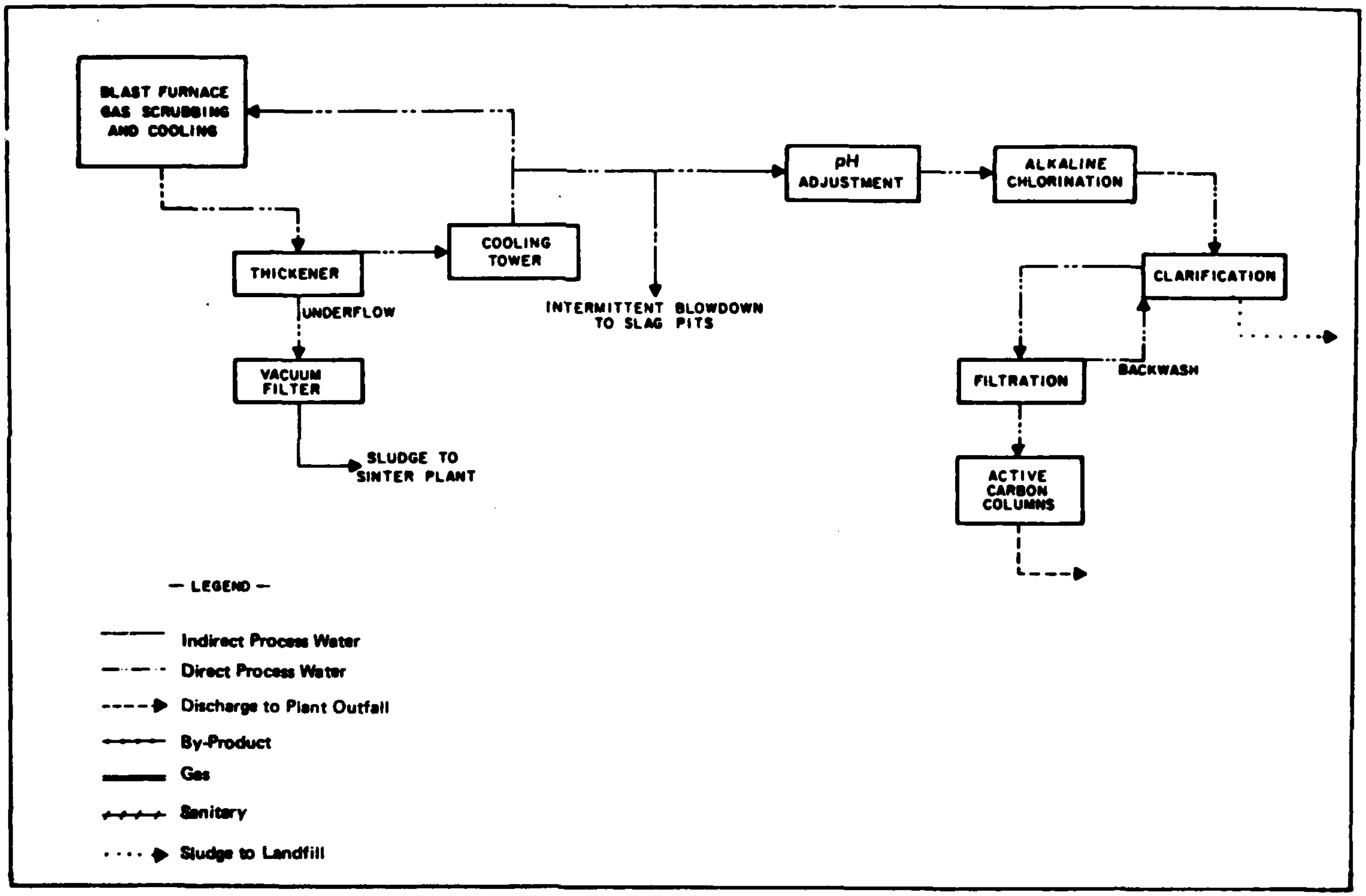
1.307
The wastewater from the blast furnace gas cooling and cleaning system is by far the most significant blast furnace wastewater discharge. Since there is direct contact between the water and the blast furnace gases, the resultant wastewater will contain suspended solids, ammonia, sulfide, cyanide, phenol, and a variety of organic compounds. Essentially no fluorides will be present due to the elimination of fluorspar as a fluxing agent. The blast furnace wastewater is subjected to a number of recycling and treatment steps, which are shown in Figure 1-20. Water from the blast furnace scrubber is first sent through a thickener for the removal of heavy suspended solids; following this step the wet sludge is dewatered by vacuum filtration (the sludge is then sent to the sinter plant for recovery of iron). Since the water will be heated during contact with the hot blast furnace gases it must pass through a cooling tower prior to being recycled back to the scrubbers. To maintain the concentration of dissolved salts and other chemical constituents at an acceptable level, a portion of the water is purged from the recycle loop and subjected to further treatment prior to discharge. The flow rate of water discharged is 443 m^3/hr, (1,950 gpm) which is 18 percent of the once-through blast furnace gas cooling and cleaning requirement of 243 m^3/hr (10,840 gpm).

1.308
The wastewater purged from the cooling tower is subjected to pH adjustment, alkaline chlorination for the destruction of cyanide,



Source: United States Steel Corporation.

Figure 1-19 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE BLAST FURNACE



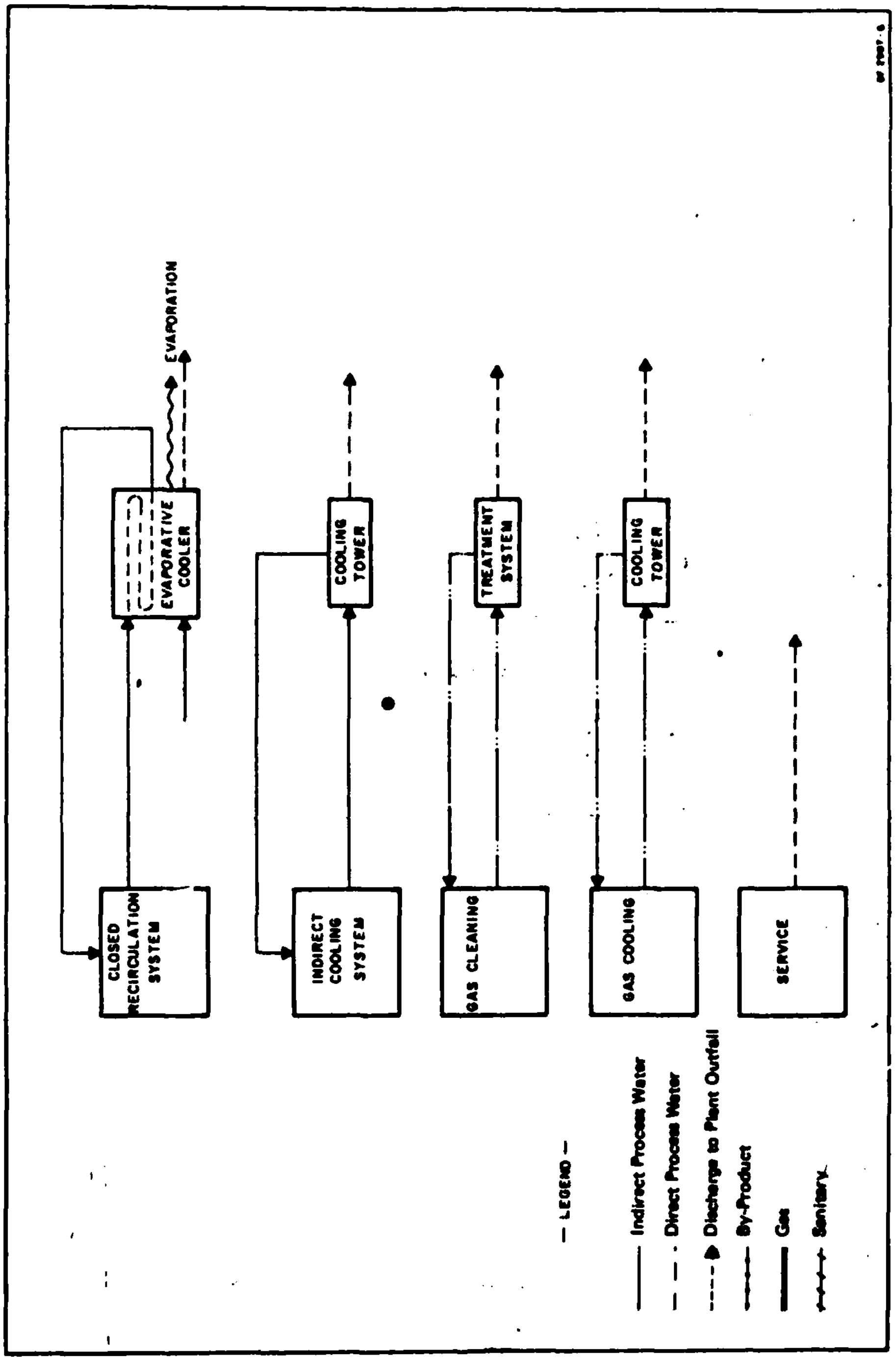
Source: United States Steel Corporation.

Figure 1-20 FLOW DIAGRAM OF BLAST FURNACE WASTEWATER TREATMENT SYSTEM

phenol, and ammonia, clarification and filtration for the removal of fine suspended solids, and finally, activated carbon absorption for the removal of excess chlorine and chlorinated organics formed in the chlorination process. The sludge from the final clarifier is disposed of in a landfill. When the "dry" slag processing alternate is used, a portion of the blast furnace wastewater that is normally sent through the treatment plant would be diverted and disposed of intermittently by evaporation as the blast furnace slag cools.

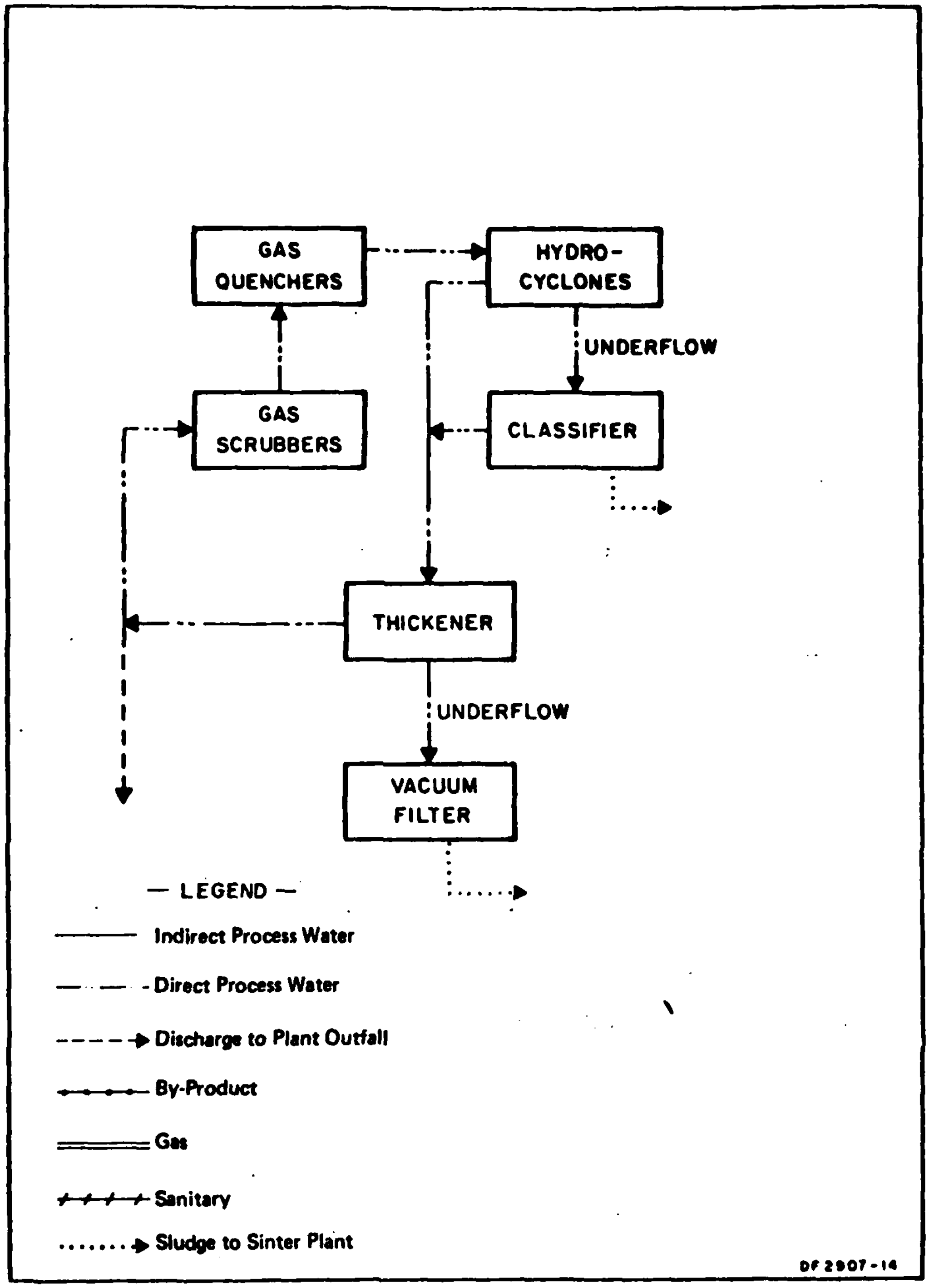
e) Steelmaking

1.309
There are five wastewater streams generated by the Q-BOP steelmaking facility: (1) blowdown from the evaporative cooler used in cooling the furnace gas containment hoods, (2) blowdown of cooling water from the indirect cooling system used for the cooling of furnace equipment, (3) blowdown from the off-gas cleaning operation, (4) miscellaneous service and maintenance water, and (5) gas cleaning scrubber water. A flow chart illustrating process water usage during steelmaking is presented in Figure 1-21. Cooling of the furnace gas containment hoods, and furnace equipment is accomplished by non-contact cooling systems. No chemical additives will be used, and the blowdown will be discharged without treatment. The most significant wastewater discharge is the scrubber water from the off-gas cleaning system. Since there is direct contact between the water and the off-gases from the furnaces, the wastewater will contain suspended solids, and possibly small amounts of other substances. Essentially, no fluoride should be present in the wastewater because fluorspar will not be used as a fluxing agent. The gas scrubber and quencher water is partially recycled and subjected to several treatment steps prior to discharge. The spent water from the gas quenchers, which contains the chamber particles removed from the furnace gases, is first sent through hydrocyclones for clarification. The clarified water is recycled back to the scrubber with a portion purged from the system and discharged in order to control the buildup of dissolved solids. Underflow from the thickener is dewatered by vacuum filtration and recycled to the sinter plant. The flow rate of the water discharged is expected to be 280 m^3/hr (1,230 gpm), which is equivalent to 0.8 m^3/tonne (75 gallons per ton) of steel. This process is illustrated in Figure 1-22. In the off-gas cleaning operation, the gas is cooled by direct contact of water prior to utilization as a fuel. The blowdown from this cooling system is expected to contain only a minimal amount of contaminants since the cooled gas has already been scrubbed for the purpose of removing particulates. The miscellaneous service and maintenance wastewater stream which is small in volume and relatively uncontaminated will be discharged without treatment through the main plant discharge.



Source: United States Steel Corporation.

Figure 1-21 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED IN THE STEELMAKING PROCESS



Source: United States Steel Corporation.

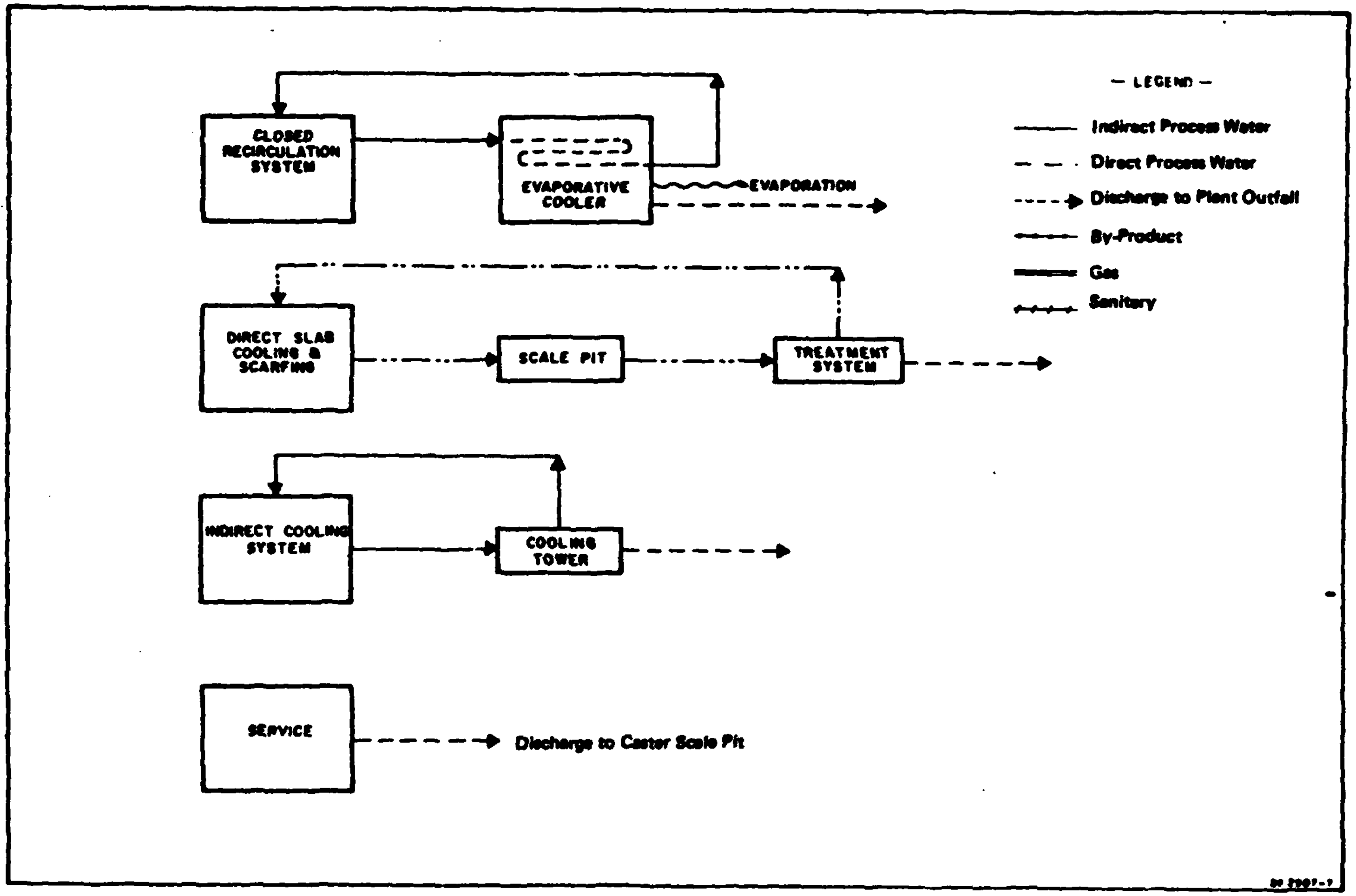
Figure 1-22 **FLOW DIAGRAM OF STEELMAKING WASTEWATER TREATMENT SYSTEM**

f) Continuous Caster

1.310
There are four wastewater streams generated by the continuous caster facility: (1) blowdown from the closed cooling water recirculation system used for mold cooling, (2) blowdown from the indirect cooling system used for cooling caster components, (3) miscellaneous service and maintenance water, and (4) direct contact water used in slab cooling and scarfing operations. A flow chart diagram for each of the caster waste streams is presented in Figure 1-23. The blowdown streams from the closed cooling water recirculation system and the indirect cooling system used for cooling caster compounds will not contain chemical additives and will be discharged without treatment. A small volume of miscellaneous service and maintenance water containing suspended solids, will be discharged to the scale pit where it will be combined with the wastewater from direct slab cooling and scarfing operations. The most significant wastewater stream is that from direct slab cooling and scarfing. Since this water comes in contact with the metal it will contain suspended solids and oil and grease and, therefore, must be treated prior to discharge. The treatment system for continuous caster wastewater is illustrated in Figure 1-24. Contaminated wastewater from the continuous caster first enters a scale pit for the removal of coarse mill scale by multi-media filtration. After filtration, the treated water is sent through a cooling tower to remove a portion of the heat that is picked up in the slab cooling and scarfing operations. From the cooling tower most of the water is recycled back to the process. A small amount of treated wastewater is purged from the system and discharged to prevent the buildup of dissolved solids. Of the 17,200 m^3/hr (75,600 gpm) of water required by the direct slab cooling and scarfing operations, only 1,040 m^3/hr (4,580 gpm) is eventually discharged, which is equivalent to 300 gallons per ton of product. The solids-laden filter backwash water is sent to a thickener from where the overflow is recycled back to the scale pit, while the underflow is dewatered by vacuum filtration. The resultant sludge is sent to a landfill. This treatment system has been patterned after the one presently being used at U.S. Steel Corporation's Texas works.

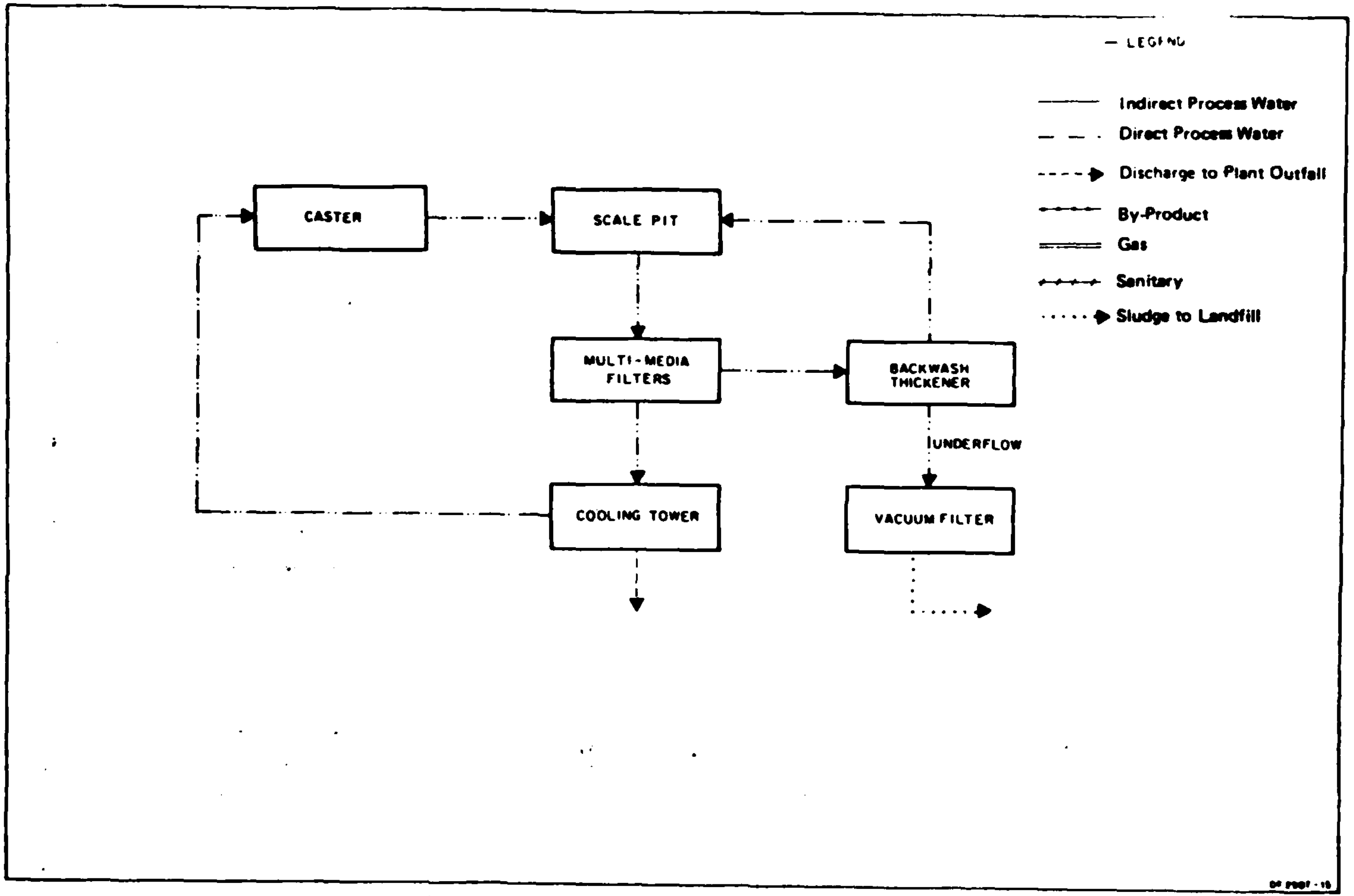
g) Hot Strip Mill and Plate Mill

1.311
The hot strip mill generates three wastewater streams: (1) indirect cooling water blowdown, (2) miscellaneous service and maintenance water, and (3) direct cooling water. Each wastewater stream is diagrammed in Figure 1-25. The indirect cooling water will not contain chemical additives and, therefore will be discharged without treatment. A small volume of service water containing suspended



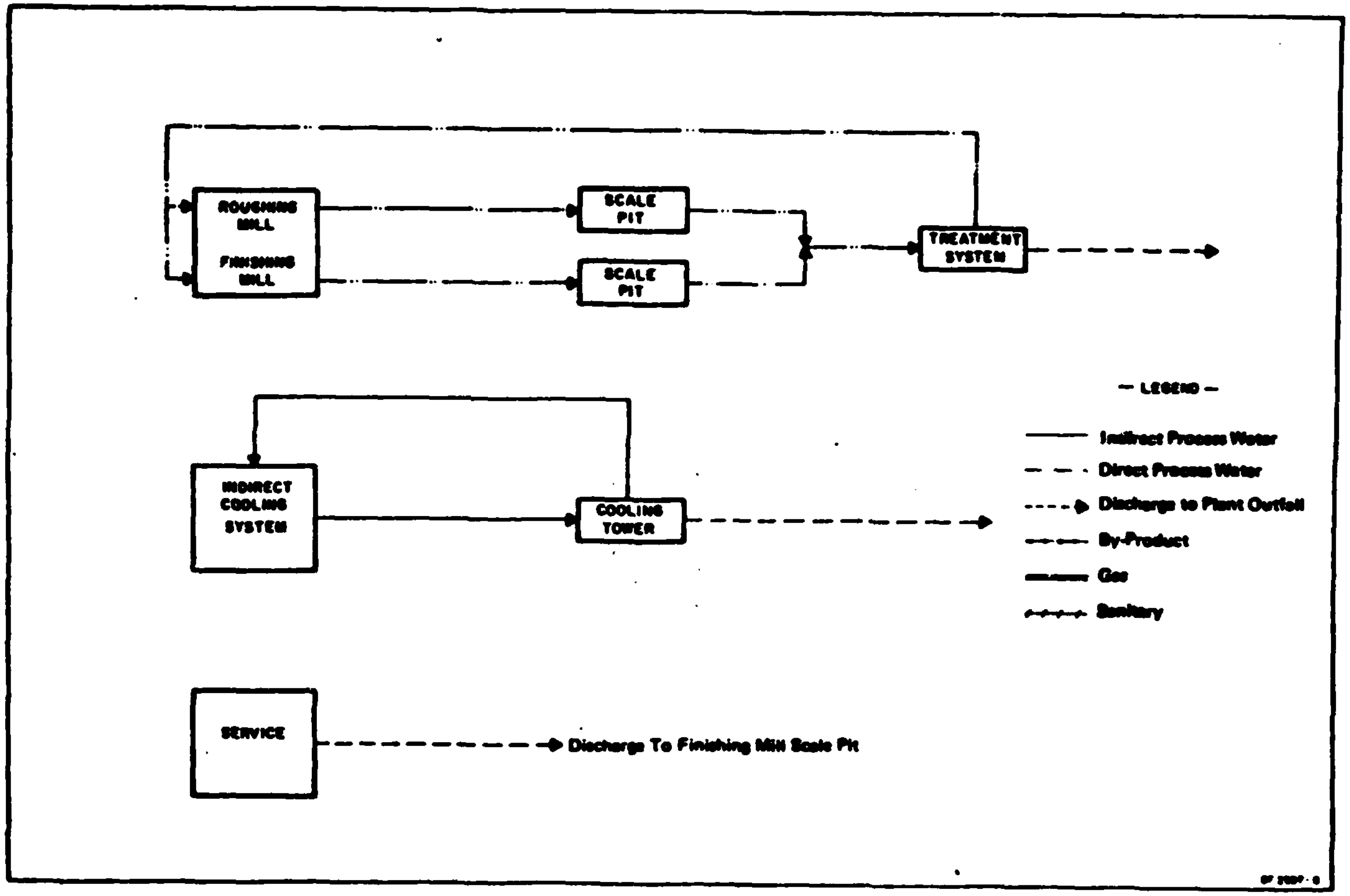
Source: United States Steel Corporation.

Figure 1-23 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE CONTINUOUS CASTING FACILITY



Source: United States Steel Corporation.

Figure 1-24 FLOW DIAGRAM OF CONTINUOUS CASTING FACILITY WASTEWATER TREATMENT SYSTEM



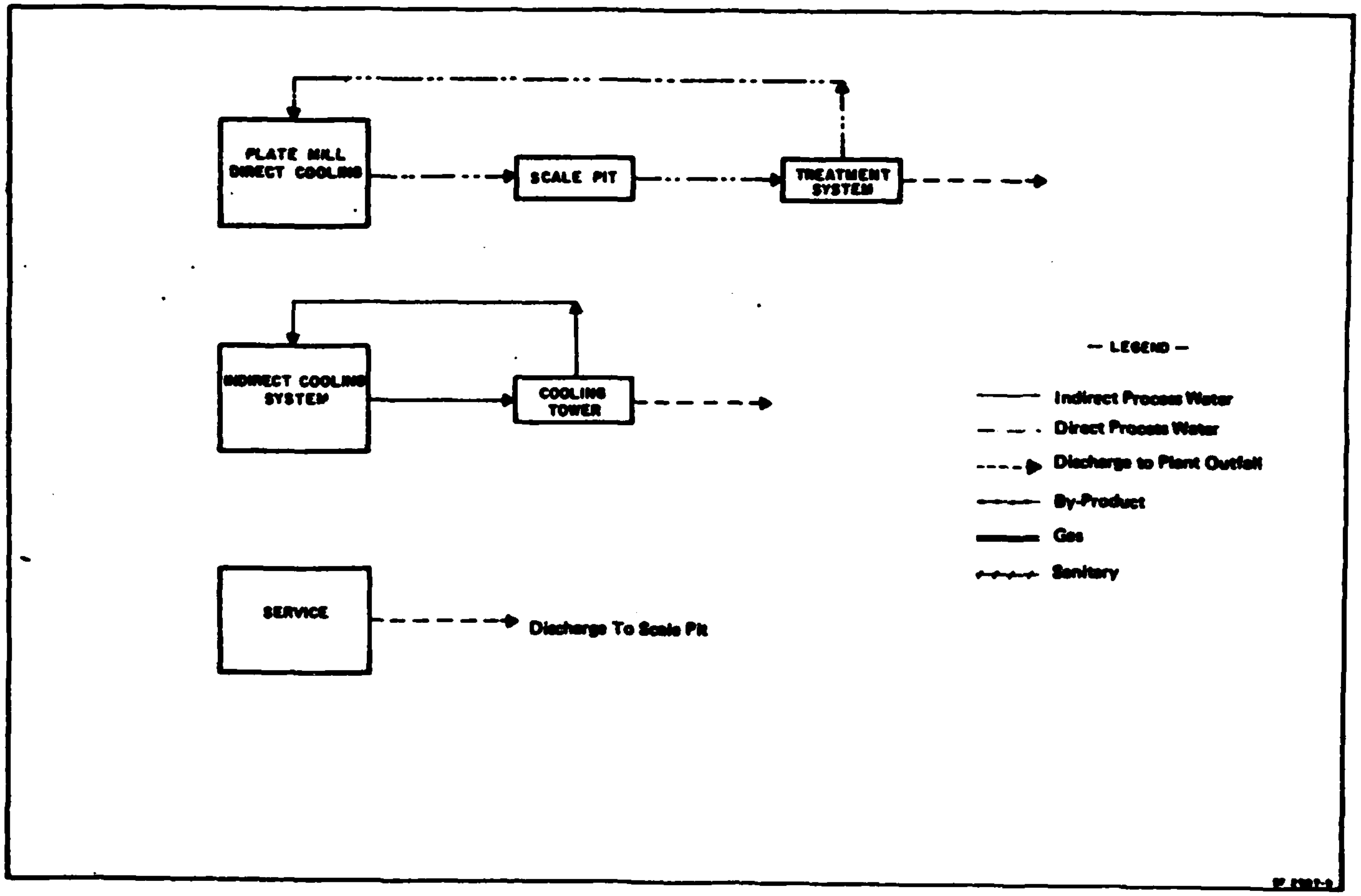
Source: United States Steel Corporation.

Figure 1-25 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE HOT STRIP MILL

solids will be discharged to the scale pits where it will be combined with other wastewater streams and subjected to further treatment prior to discharge. The most significant wastewater stream from the hot strip mill is the direct contact cooling water from the roughing mill and the finishing mill. Wastewater effluents from the plate mill, diagrammed in Figure 1-26 are quite similar to those of the hot strip mill, namely, (1) indirect cooling water blowdown, (2) miscellaneous service and maintenance water, and (3) plate mill direct cooling water. Both the hot strip mill and the plate mill are equipped with scale pits for the removal of coarse mill scale. Scale that is collected during this process is removed from the wastewater stream and recycled to the sinter plant. Due to the similarity of the waste streams, it is planned that the hot strip mill and plate mill effluents will be treated in a common system as shown in Figure 1-27. The effluents from the scale pits will be directed initially to a surge storage basin where a portion of the basin effluent will be recycled directly to flume flushing service at both mills. The remaining effluent will be subjected to multi-media filtration for further suspended solids removal and then sent to a cooling tower for heat removal prior to being recycled back to both mills. A portion of the treated wastewater is purged from the recycle system and discharged to prevent the buildup of dissolved solids. The filter backwash water, containing the suspended solids removed from the wastewater stream, is sent to a thickener. Underflow from the thickener is dewatered by vacuum filtration and the resultant sludge disposed of to landfill. The total amount of treated wastewater is charged from the two mills (via the common treatment system) is 1,634 m^3/hr (7,190 gpm), which is about five percent of the direct cooling water requirements of both mills.

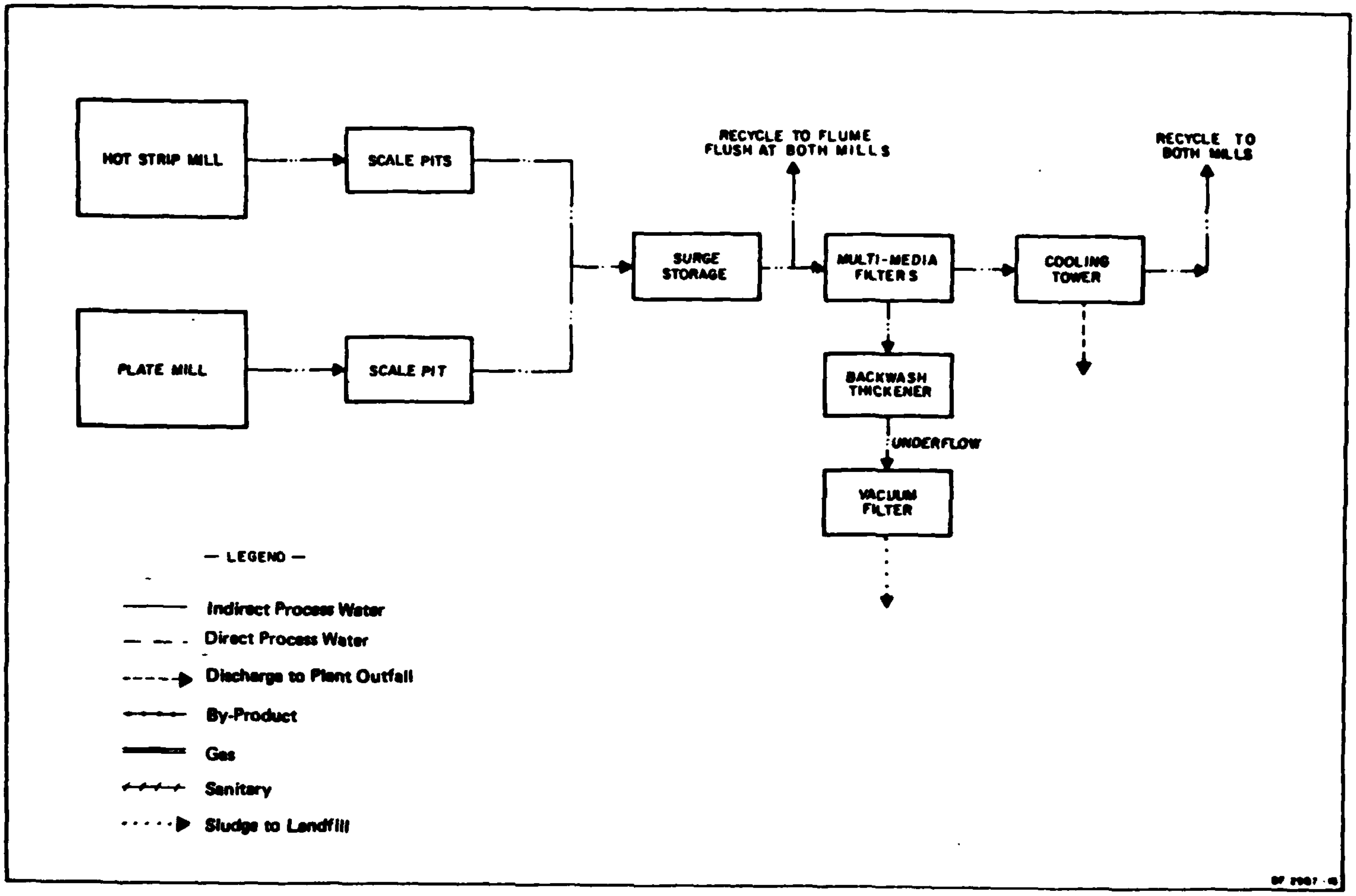
h) Power House

1.312
The proposed plant will have a power house to provide steam for the operation of the blast furnace blowers and the generation of electricity. As shown in Figure 1-28, the principal wastewater stream from the power house is blowdown from the non-contact cooling water circuit used primarily for condenser cooling. In addition, there will be relatively small and intermittent wastewater streams consisting of boiler blowdown and waste brine from the regeneration of ion exchange equipment. The principal contaminant in these two streams will be inorganic dissolved solids. Both streams will be discharged without treatment to the central plant wastewater collection and discharge system.



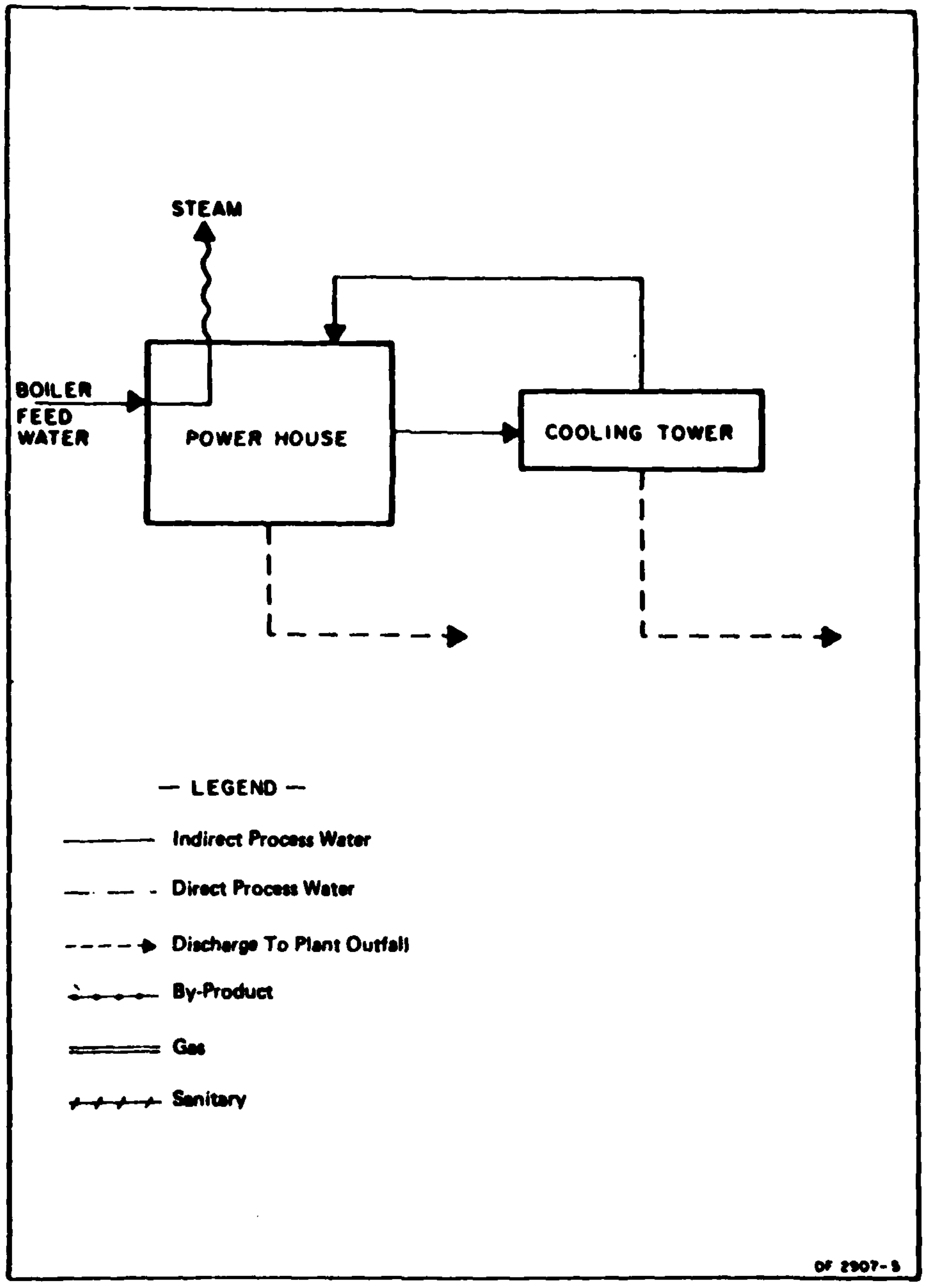
Source: United States Steel Corporation.

Figure 1-26 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE PLATE MILL



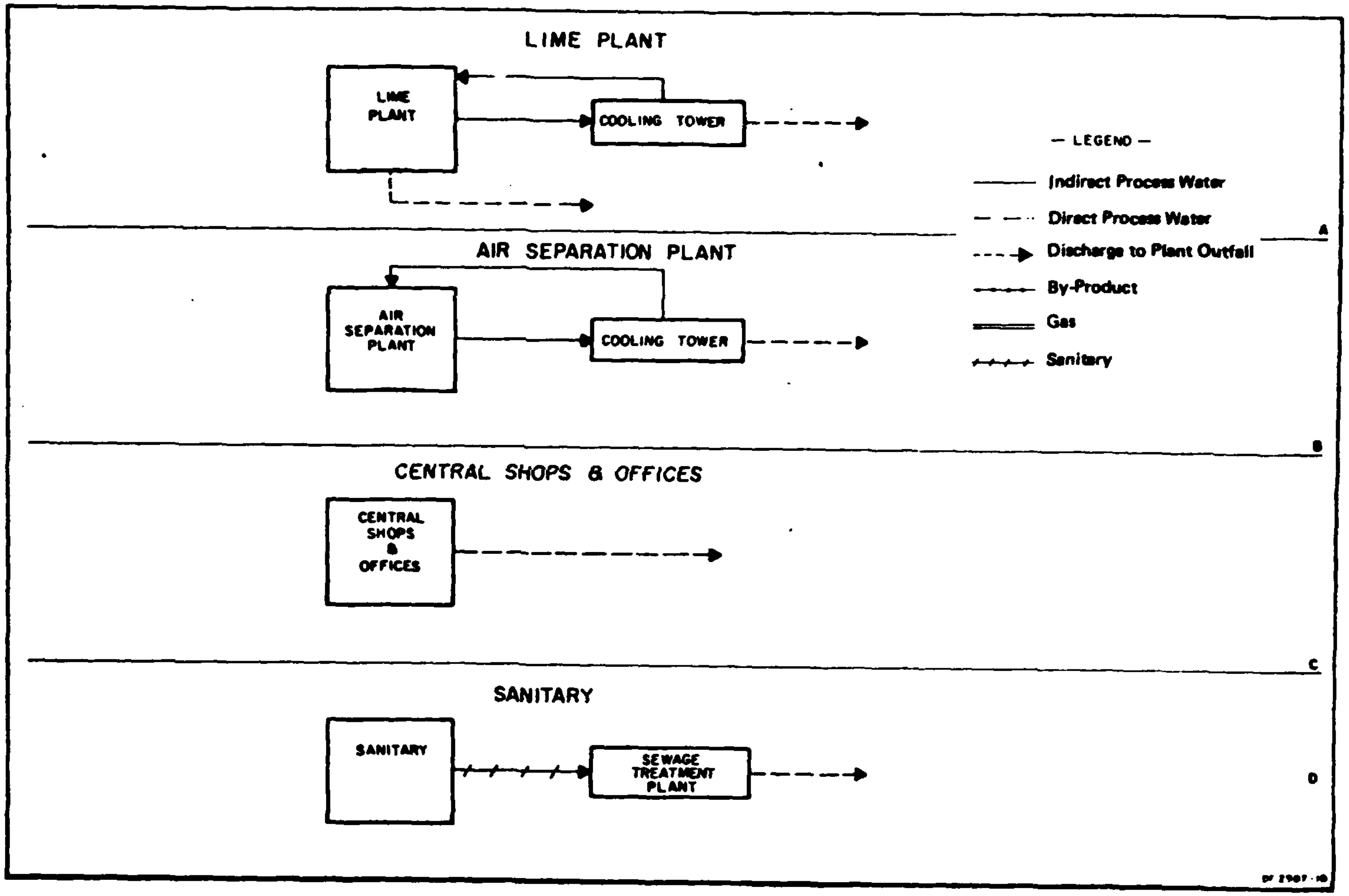
Source: United States Steel Corporation.

Figure 1-27 FLOW DIAGRAM OF HOT STRIP MILL AND PLATE MILL WASTEWATER TREATMENT SYSTEM



Source: United States Steel Corporation.

Figure 1-28 FLOW DIAGRAM OF WASTEWATER STREAMS GENERATED BY THE POWER HOUSE



Source: United States Steel Corporation.

Figure 1-29 FLOW DIAGRAMS OF MISCELLANEOUS WASTEWATER STREAMS

i) Other Wastewater Stream

1.313
The miscellaneous sources of wastewater are shown in Figure 1-29 and are described below:

Lime Plant -The main wastewater discharge from the lime plant consists of blowdown from the indirect cooling water circuit. There is an additional and relatively small wastewater stream consisting of miscellaneous service and maintenance water. Both are discharged without treatment to the main plant wastewater collection system.

Air Separation Plant - The only wastewater stream generated by this activity is blowdown of water from the indirect cooling system. Wastewater from this facility is discharged without treatment.

Central Shops and Offices - Water usage in the central shops and offices relates to service activities and equipment maintenance. It is discharged without treatment to the main plant collection system.

Sanitary - All sanitary water from the plant facilities will be collected and processed in a conventional activated sludge sewage treatment facility and discharged. The applicant estimates that the proposed treatment plant will be able to reduce the biochemical oxygen demand of raw sewage to approximately 30 mg/liter based on a flow rate of 60 m^3/hr (265 gpm). Sludge generated during the treatment process will be deposited on the coal piles.

j) The Discharge of Non-Contact Cooling Water

1.314
As noted in previous sections, many of the production and auxiliary facilities discharge blowdown streams from non-contact cooling water systems. The blowdown streams are discharged untreated into the central plant wastewater discharge system where they combine with the collected process water streams to form a single waste stream. Non-contact cooling water is, by definition, water which does not directly come in contact with pollutants during the course of the cooling process. Based on industry experience with Lake Erie water, it is expected that three basic types of water treatment chemicals will be required to control the quality of the water used in the indirect cooling water recycle systems. These are as follows:

(1) Dispersants to prevent deposition of suspended solids and scale,

(2) Corrosion inhibitors, and

(3) Biocides to suppress the growth of microorganisms in the cooling system.

The applicant intends to use presently available additives which, by the time they are discharged, will have degraded into nontoxic materials. There is little doubt that many of the possible additives could require further evaluation as part of the NPDES permitting process. Small quantities of coagulants, such as synthetic polyelectrolytes, improve suspended solids removal prior to the use of raw makeup water. The applicant plans to avoid using water treatment chemicals that contain heavy metals or other substances that would have a significant adverse effect on the quality of the discharge from the cooling water system. Since particulate matter in ambient air is picked up by cooling water as it passes through the cooling tower, the suspended solids concentration of the cooling tower blowdown will be greater than that of the water supplying the tower. The increase in concentration of suspended solids in the cooling tower blowdown depends heavily on the concentration of particulate matter in the immediate vicinity of the cooling tower and on the design features of the tower. A rough estimate by the applicant's consultant Arthur D. Little, Inc. (using the anticipated particulate concentration in the immediate vicinity of the plant and a number of assumptions concerning cooling tower air flow, scrubbing efficiency, etc.) indicates that the daily average net suspended solids loading in the cooling tower blowdown would be 180 lbs/day, or slightly less than 1 mg/l, while the maximum suspended solids loading is expected to be approximately 1,100 lbs/day, or 3.1 mg/l. There will be a difference between the temperature of the effluent and the temperature of the receiving water body at the point of discharge.

k) The Combined Wastewater Discharge

1.315
All of the treated process wastewater streams, cooling tower blowdown streams, miscellaneous service water, and treated sanitary wastewater will be combined into a single wastewater discharge stream. The total wastewater flow rate, under conditions of peak production, will be 11,100 m^3/hr (48,900 gpm).

l) Effluent Inventory

1.316
The expected composition of the wastewater effluent discharged from the proposed Conneaut Lakefront Plant is presented in Tables 1-27 through 1-29. A listing of the priority pollutants that might be present in the Lakefront Plant or its wastewater effluent are presented in Tables 1-30 and 1-31, respectively.

Table 1-27

Projected Net Loads of Guideline Parameters in the Lakefront Plant's Effluent

Parameter	Net Loads "Annual Average"(1) (kg/d)	30-Day Average(2) (kg/d)	Daily Maximum(3) (kg/d)
Ammonia	226	238	714
Cyanide (A)(4)	4.2	4.47	13.6
Fluoride	342	389	1170
Oil and Grease	308	370	1110
Phenols	8.35	8.94	26.8
Sulfide	6.1	6.67	19.5
Suspended Solids(5)	1260	1370	3630

(1) Derived from average annual production rates and EPA guidelines for 30-day average. Since this 30-day average is the maximum allowed in this time period, actual averages would be somewhat lower. Thus, these projected net loads are conservative.

(2) Derived from maximum production rates and EPA guidelines for 30-day average.

(3) Derived from maximum production rates and EPA guidelines for maximum daily discharge.

(4) Cyanide that is amenable to destruction by alkaline chlorination.

(5) Includes 451 kg/d from processes or wastewaters not covered by guideline parameters (e.g., sanitary wastewaters and cooling tower blowdown).

Source: United States Steel Corporation.

Table 1-28

Projected Characteristics of Main Wastewater Discharge from the Proposed Plant

	1		2		3	
	Net Load from Proposed Plant		Concentrations in Intake (Lake Erie) Water		Resulting Effluent Concentration	
Parameter	Annual Average (kg/day)	Daily Maximum (kg/day)	Typical (mg/1)(2)	High (mg/1)(2)	Typical (mg/1)(2)	Worst (mg/1)(2)
Flow, m^3/hr	N/P(1)	N/P	N/P	N/P	10,350(3)	11,086(3)
Temperature, °C						
Summer:	N/P	N/P	23	N/P	25	33
Winter:	N/P	N/P	1	N/P	7	20
Ammonia (Total)	226	714	0.04	0.3	0.96	3.1
Arsenic (Total)	0.40	0.80	0.001(4)	0.005(4)	0.0030	0.0097
BOD_5	836	1920	1.7	3.0	5.7	11.
Cadmium (Total)	0.01	0.02	0.001	0.005	0.0014	0.0066
Chromium (Total)	4.54	13.6	0.005	0.010	0.025	0.064
COD	8240	34000	10	25	47	160
Copper (Total)	0.0	0.0	0.001	0.005	0.0014	0.0066
Cyanide (Total)	32.8	100.	0.0004(4)	0.0008(4)	0.13	0.38
Cyanide (A)	4.2	13.6	0.0002(4)	0.0005(4)	0.017	0.052
Dissolved Oxygen	N/P	N/P	11	15 (low 7)	6.6	8.0 (low 4)
Fluoride	342	1170	0.13	0.20	1.6	4.7
Iron (Dissolved)	164	458	0.05	0.1	0.73	1.9
Lead (Total)	9.07	18.1	0.005	0.01	0.044	0.082

Table 1-28 (Continued)

	1		2		3	
	Net Load from Proposed Plant		Concentrations in Intake (Lake Erie) Water		Resulting Effluent Concentration	
Parameter	Annual Average (kg/day)	Daily Maximum (kg/day)	Typical (mg/l)(2)	High (mg/l)(2)	Typical (mg/l)(2)	Worst (mg/l)(2)
Manganese (Total)	46.3	90.7	0.01	0.02	0.20	0.37
Mercury (Total)	0.0	0.0	0.0001	0.0003	0.00014	0.0004
Oil and Grease	308	1110	1	5	2.6	10.8
pH, Standard Units	N/P	N/P	7.8	8.3 (low 7.0)	7.3	8.3 (low 6.0)
Phenols	8.35	26.8	0.0006	0.003	0.034	0.10
Specific Conductance, μ mhos	N/P	N/P	300	600?	700	900
Sulfide	6.1	19.5	0.002	0.010	0.027	0.087
Total Dissolved Solids	78200	141000	200	250	590	860
Total Suspended Solids	1260	3630	10	20	19.	40.
Zinc	1	2	0.020	0.070	0.031	0.10

(1) NP = Not Pertinent.
(2) Unless otherwise specified with parameter name.
(3) These are dry weather flows. Runoff from roofed areas is projected to add approximately 1300 m^3/hr to discharge from a 2.5 in., 24-hour storm.
(4) These concentrations are estimates, since background levels are below detection limits.

Source: Arthur D. Little, Inc. estimates and United States Steel Corporation.

Table 1-29

Projected Temperature of Lakefront Plant Wastewater Effluent

Effluent Stream	Flow (m³/hr)	Temperature, °C Summer Average	Temperature, °C Summer Maximum	Temperature, °C Winter Average	Temperature, °C Winter Maximum
Cooling Tower Blowdown	6,680	23	31	4	18
Process Blowdown					
a) Coke Plant	237	30	36	30	36
b) Sinter Plant	271	54	54	46	46
c) Blast Furnace	443	23	31	4	18
d) BOF	279	57	57	49	49
e) Continuous Caster	1,042	23	31	4	18
f) Hot Strip and Plate Mill	1,634	23	31	4	18
g) Other	514	28	35	12	24
Subtotal	4,420	28	35	12	24
Combined Effluent	11,100	25	33	7	20
Mean Lake Temperature		23		1	
Increase in Water Temperature		2	10	6	19

Source: Arthur D. Little, Inc. estimates.

Table 1-30

Priority Pollutants That May be Present in Proposed Lakefront Plant Effluent

Organics (not Chlorinated)

Benzene
Toluene
Phenol(3)
Napthalene
Dioctylphthalate(1) (2)

Organics (Chlorinated)

Chloroform(1)
Tetrachloroethane(1)

Inorganics

Cyanide(3)
Arsenic
Antimony
Cadmium
Chromium
Lead
Nickel
Zinc
Selenium(1)
Silver(1)
Thallium(1)

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(1) Presence is somewhat speculative. Recent analyses have indicated the presence of these materials. Detectability may be dependent wholly on background concentrations.

(2) Believed due to error related to sampling.

(3) These parameters were included in proposed effluent guidelines by the EPA in 1974.

Source: United States Steel Corporation (based on steel industry effluent analyses conducted by the USEPA).

Table 1-31

Priority Pollutants That May be Present in Wastewaters from a Steel Mill

Organics (Not Chlorinated)(1)

- Phenol(3)(4)
- Benzene(3)
- Toluene
- Ethylbenzene
- Dimethyl phenol
- Dinitrotoluene
- Naphthalene(3)
- Fluoranthene
- Polynuclear aromatic hydrocarbons [13]

Organics (Chlorinated)

- Chlorinated benzenes [3]
- Chlorinated ethanes [7]
- Chlorinated naphthalene[1]
- Chlorinated phenols [2]
- Chloroform
- 2-Chlorophenol
- Dichlorobenzenes [3]
- 2, 4-Dichlorophenol
- Dichloropropane [2]
- Halomethanes [8]
- Pentachlorophenol
- Tetrachloroethylene
- Trichloroethylene

Inorganic(2)

- Lead(3)
- Chromium(3)
- Cyanide(3)(4)
- Zinc(3)
- Antimony(3)
- Arsenic(3)
- Cadmium(3)

---

(1) Listed in order of expected concentration, highest first.

(2) Listed in order of expected net loads, highest first.

(3) Chemicals that have been found in effluents from processes similar to those expected at the proposed plant (Table 1-28).

(4) These parameters were included in proposed EPA effluent guidelines in 1974.

Note: Chemicals listed as given in the original list associated with the EPA Settlement Agreement. Numbers in brackets after a chemical classification indicate the number of specific chemicals in that class that were subsequently specified by the USEPA. These specific chemicals are listed on page 4-869a.

Source: Arthur D. Little, Inc. estimates.

Table 1-31 (Continued)

*Chlorinated benezenes

- chlorobenezene
- 1,2,4-trichlorobenzene
- hexachlorobenzene

*Chlorinated ethanes

- 1,2-dichloroethane
- 1,1,1-trichloroethane
- hexachloroethane
- 1,1-dichloroethane
- 1,1,2-trichloroethane
- 1,1,2,2-tetrachloroethane
- chloroethane

*Chlorinated naphthalene

- 2-chloronaphthalene

*Chlorinated phenols

- 2,4,6-trichlorophenol
- parachlorometa cresol

*Dichlorobenzenes

- 1,2-dichlorobenzene
- 1,3-dichlorobenzene
- 1,4-dichlorobenzene

*Dichloropropane and dichloropropene

- 1,2-dichloropropane
- 1,2-dichloropropylene (1,3 dichloropropene)

*Halomethanes

- methylene chloride (dichloromethane)
- methyl chloride (chloromethane)
- methyl bromide (bromomethane)
- bromoform (tribromomethane)
- dichlorobromomethane
- trichlorofluoromethane
- dichlorodifluoromethane
- chlorodibromomethane

*Polynuclear aromatic hydracarbons

- benzo(a)anthracene (1,2-benzanthracene)
- benzo(a) pyrene (3,4-benzopyrene)
- 3,4-benzofluoranthene
- benzo(k)fluoranthane (11,12-benzofluoranthene)
- chrysene
- acenaphthylene
- anthracene
- benzo(ghi)perylene (1,12-benzoperylene)
- fluroene
- phenathrene
- dibenzo (a,h) anthracene (1,2,5,6-dibenzanthracene)
- indeno (1,2,3-cd)pyrene (2,3-o-phenylenepyrene)
- pyrene

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*Specific compounds and chemical classes as listed in the consent degree from NRDC et al versus Train.

Solid Waste Management Systems

1.317
The total amount of residuals generated by the proposed Lakefront Plant will be 5,274,822 dry metric tons per year for the final design capacity of 6.8 million tonnes (7.5 million tons) steel production. This estimate is based on maximum residual generation rates at maximum process unit capacities. These residuals will be proportionately distributed as follows: 2,876,138 dry tonnes (3,163,752 tons) per year during the period 1981-1986 and 5,274,822 dry tonnes (5,702,304 tons) per year from 1987 through the life of the proposed plant. Of this amount 96 percent is expected to be recovered leaving only four percent for disposal by sanitary landfill. The following sections discuss the quantity and quality of residuals to be disposed of after the estimated resource recovery is achieved.

a) Resource Recovery

1.318
Solid waste generated for each process unit within the proposed facility and the estimated rate of recovery (recycle or reuse) is presented in Table 1-32. The data shown in this table indicate that a large proportion of the solid waste produced will be recycled within the proposed plant as fuel for the blast furnace or raw material input to the sinter plant. Most of the material that can be recycled will be collected by the various pollution control equipment described earlier in this chapter. The applicant has stated that of the 1,574,759 dry tonnes of pollution control residuals (solid waste) generated during plant operation, 93 percent will be recycled. This rate of recycling is relatively high compared to the general domestic iron and steel industry average of 55 percent in 1974 (1-6). Anticipated secondary processing of residuals at the proposed Lakefront Plant is shown in Table 1-33. Most of the remaining portion of recovered residuals would be slag. Slag from the blast furnace will be sold as lightweight aggregate for use in concrete block manufacture, concrete construction, and as a raw material in cement manufacture to partially replace limestone. Slag from the steelmaking facility would first be processed for metals recovery. The recovered metals within a slag matrix would be recycled to the Q-BOP in the steelmaking shop. A portion of the remaining would be continuously recycled to the blast furnace as high quality flux material, a procedure now in use at the applicant's Gary Works. The remaining steelmaking slag would require six months of aging before being sold as skid-resistant aggregate for asphalt roads, road subbase, or shoulder aggregate and railroad ballast (1-7). The aging is required to hydrate unreacted lime and magnesia, which if unreacted could cause expansion and disintegration of slag particles during field application.

Table 1-32

Solid Waste Generation and Extent of Reuse at the Proposed Lakefront Plant

Unit Operation	Total Tonnage of Solid Wastes/Sludge Generated (dry tonnes/year)	% Recycled or Reused (rounded to nearest %)	Amount for Landfill (dry tonnes/year)	Comment
Open Storage Yards		100%	0	Residuals from surface runoff sedimentation basins returned to piles.
Lime Plant Operations	39,622	99	97	Kiln cyclone and baghouse dust (27,400 mt/yr) assumed re-used.
Coke Plant Operations	93,110	89	600	Landfill tonnage is averaged from replacement of coke oven refractory every 20 years.
Sinter Plant	25,240	99	290	Dusts from cyclone and fabric filters recycled.
Blast Furnace Operations	3,456,654	99	44,065	Percent reused includes 2 million mt/yr of granulated and dry pit slags sold to external contractors.
Steel Making Operations	1,195,312	98	21,106	All of Q-BOP and ladle slags are reused. Partly recycled to blast furnaces, the rest is sold.
Continuous Casting	221,859	95	10,200	Recycled as sinter plant feed or scrap to steelmaking.
Hot Strip Mill	84,254	98	1,902	Mostly scale recycled to sinter plant.
Plate Mill Operation	37,321	88	4,299	Mostly scale recycled to sinter plant.
Power Plant	98,778	0	98,775	Some 2.5 mt/yr of lube oil is recovered.
Water and Wastewater System	15,125	0	15,093	Original recycling plan changed to improve site runoff water quality.
General Plant Refuse	7,547	0	7,547	Estimated from Applicant's Fairless Works' general plant refuse data.
Total	5,274,822	96	203,974	

Source: United States Steel Corporation.

Table 1-33

Secondary Processing of Residuals at the Proposed Lakefront Plant(1)

Unit Operation	Type of Residual	How Reprocessed	Amount Reprocessed (tonnes/year)
Lime Plant	Conveyor belt idlers, worn screen cloth and steel scrap	Recycled as scrap steelmaking shop	100
	Worn conveyor belting	Sold to manufacturers	25
	Kiln baghouse dust	Sold, or recycled to sinter plant	5,400
	Kiln cyclone dust	Sold, or recycled to sinter plant	22,000
	Mill baghouse dust	Fed with ground lime to steel-making shop	12,000
	Subtotal		39,525
Coke Plant	Dust from coal-crushing, mixing, preheating and oven charging	Recycled to coal feed	64,634
	Coke spillage	Fed to blast furnaces	1,752
	Quench station-coke breeze	Used as sinter plant fuel	13,131
	Resinous muck oil	Dehydrated and used as boiler fuel	3,416
	Subtotal		82,933
Sinter Plant	Belt idlers, scrap metal, worn screen cloth	As scrap to steelmaking shop	1,000
	Worn conveyor belting	Sold to manufacturers	150
	Cyclone dust	Continuously recycled to sinter furnace	14,000
	Fabric filter dust	Continuously recycled to sinter furnace	9,800
	Subtotal		24,950
Blast Furnace Section	Stockhouse fines, dust, and spillage	Recycled to sinter plant	1,064,365
	Used screen cloth and runner scrap	Recycled to basic oxygen plant	35,050
	B F flue dust, sludge, and bag-house dust	Recycled to sinter plant	212,150
	Granulated and dry pit slags	Sold to outside buyers	2,100,000
	Stove refractories and tuyeres	Recycled to manufacturers	1,024
	Subtotal		3,412,589
Steel Making Shop	Filter cake from wastegas fumes	Recycled to sinter plant	42,705
	Q-BOP furnace and ladle slags	Slag is processed for metal recovery. Recovered metallic flux sent to blast furnace. Rest of slag is saleable after aging.	1,131,500
	Subtotal		1,174,205

Table 1-33 (Continued)

Unit Operation	Type of Residual	How Reprocessed	Amount Reprocessed (tonnes/year)
Continuous Casting Operation	Tundish dump slag	Recycled as scrap to the steel-making process	68,000
	Hot slab scales	Recycled through scale pit to sinter plant	34,000
	O_2 Torch Cutting Kerf	Recycled through scale pit to sinter plant	12,300
	Scarfing slag and sludge	Recycled through scale pit to sinter plant	96,658
	Tundish cleaning dust	Recycled to sinter plant	701
	Subtotal		211,660
Hot Strip Mill	Hot strip mill and slab reheat furnace scale	Recycled through scale pit to sinter plant	73,000
	Scale from processing lines	Recycled through scale pit to sinter plant	153
	Roll Mill Rolls	Sold to roll manufacturers	9,090
	Operating consumables (i.e., solid metallics from bearings, shear knives, grinding tools, crane wheels, couplings and spindles, cables and slings)	Recycled to steelmaking operation operation	107
	Subtotal		82,352
Plate Mill Operation	Scale from reheat furnace, descaler of rolling stands	Recycled to sinter plant	32,500
	Plate mill rolls	Sold to manufacturer	493
	Operating consumables (i.e., bearings, shear knives, crane wheels, cables and slings)	Recycled-through steel melting shop	29
	Subtotal		33,022
Power Plant	Spent lube oil	Collected and pumped into fuel oil system	2

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(1) Excludes items designated for land fill.

Source: United States Steel Corporation.

b) Quantities of Wastes Requiring Disposal

1.319
A summary of the various residuals requiring land disposal is shown in Table 1-34. These data represent general annual averages from 1987 (the point at which production reaches 6.8 million tonnes/year) through the projected life span of the facility. In some cases, the estimates presented may include waste streams for which only partial recycling is feasible at this point in time. However, as technology advances these wastes may be totally recycled. Typically iron and steel plants dispose of their unsalable nonrecyclable waste through contractual arrangements with an approved commercial landfill. However, in the Regional Study Area, there are no commercial landfill sites with capacity available for receipt of the wastes from the proposed plant. Therefore, the applicant plans to dispose of solid wastes on site with special handling as needed for leachate collection and treatment. Projected volumes of waste requiring land disposal during construction Steps I and II combined are shown in Tables 1-35 and 1-36, respectively.

c) Physical/Chemical Character of Wastes Requiring Disposal

1.320
Specific, detailed analyses of each waste are not available at this time. The makeup of each waste depends greatly on the composition of the raw materials, recycled materials, and the manner in which the facility is operated. Ranges provided are based on typical integrated steelmaking facilities (i.e., use of purchased scrap and, therefore, are included only for the purpose of establishing maximum numbers. These estimates should not be construed to be actual projections. A qualitative description of each process unit solid waste component requiring onsite land disposal is presented in Table 1-37. Specific data relative to the types of solid waste streams generated and the expected range of chemical quality is presented below for selected process units at the Lakefront Plant.

Lime Plant
1.321
The basic types of solid wastes resulting from this operation are refractories and lime debris. Refractories are generated as bricks in the lime kiln and are replaced during periodic maintenance. The refractory commonly used is high alumina brick composed of 21-47 percent SiO_2, 47-71 percent Al_2O_3 with traces of TiO_2, CaO, MgO, Fe_2O_3, and alkalies.

Table 1-34

Summary of Land-Disposed Residuals for the Proposed Lakefront Plant*

	Main Residual Types			
Unit Operation	Type	Amount Dumped (dry tonnes/year)	Total Dumped Residuals (dry tonnes/year)	Potentially Requires Ground Sealing **
Lime Plant Operations	Refractories	67	97	No
	Lime Debris	30		Yes
Coke Plant Operations	Refractories	600	600	No
Sinter Plant	Debris	250	290	No
	Refractories	40		No
Blast Furnace Operations	Desulfurization Slag	26,000		Yes
	Refractories	17,315	44,065	No
	Conveyor Belts and Rubble	750		No
Steel Making Operations	Refractories	20,596	21,106	No
	Hot Metal Mixer Dust	510		Yes
Continuous Casting	Refractories	10,200	10,200	No
Hot Strip Mill	Refractories	1,187		No
	Roll Grinder Metal Flues	474	1,902	Yes
	Roll Lathe Metal Turnings and Knife Grinder Fines	241		Yes
Plate Mill	Slab Yard Grinder Swarf	4,060		Yes
	Refractories	146	4,299	No
	Roll Lathe Turnings and Roll Grinder Fines	93		Yes
Power Plant	SO_2 Scrubber Sludge	78,250		Yes
	Ash	20,500	98,775	No
	Refractories	25		No
Wastewater Treatment Plant	Chemical Sludge from Sinter Plant	2,222	15,093	Yes
	Physically Separated Mill Sludges	9,433		Yes
	Coke Plant Bio-Sludge and Ammonia Still Lime Sludge	3,328		Yes
	Sanitary Severage Bio-Sludge	140		No
General Plant Refuse	Combustibles	6,515	7,547	No
	Non-Combustibles	1,032		No
Total			203,974	

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*After full steel production of 6.8 tonnes/year is reached.

**Based on EPA No. 68-01-2604.

Source: United States Steel Corporation; Arthur D. Little, Inc. estimates.

Table 1-35

Estimated Volumes of Land-Disposed Residues -- Step I

Unit Operation	Approximate Capacity of Operation	Tonnage of Residual		Estimated Gross (wet) Density	Wet Volume	
		Dry Basis (tonnes/year)	Wet Basis (tonnes/year)		(M^3/yr)	(Yd^3/yr)
Lime Plant	50%	49	49	2.0	24	32
Coke Plant	50%	300	300	2.2	140	183
Sinter Plant	100%	290	290	5.2	54	71
Blast Furnace Operation	50%	22,033	22,033	1.4	15,516	20,294
Q-BOP Furnace	66%	14,071	14,071	2.37	6,199	8,107
Slab Casting	50%	5,100	5,100	2.2	2,372	3,103
Hot Strip Mill 80"	100%	1,902	1,902	4.3	445	582
Plate Mill	0%	0	0	0	0	0
Power Plant	60%	59,265	105,375	1.3	76,585	100,166
Waste Treatment Plant	60%	9,056	30,853	1.3	23,733	31,037
General Plant Refuse	50%	3,774	3,774	0.6	6,396	8,366
Totals		115,840	183,747		131,464	171,941

Source: United States Steel Corporation; Arthur D. Little, Inc. estimates.

Table 1-36

Estimated Volumes of Land-Disposed Residuals -- Steps I and II

Unit Operation	Tonnage of Residual		Estimated Gross (wet) Density (tonnes/m^3)	Wet Volume	
	Dry Basis (tonnes/year)	Wet Basis (tonnes/year)		M^3/Year	Yd^3/Year
Lime Plant	97	97	2.0	49	64
Coke Plant	600	600	2.2	279	365
Sinter Plant	290	290	5.2	54	71
Blast Furnace Operation	44,065	44,065	1.4	31,032	40,587
Steel Making	21,106	21,106	2.4	9,298	12,161
Continuous Casting	10,200	10,200	2.2	4,744	6,205
Hot Strip Mill	1,902	1,902	4.3	445	582
Plate Mill	4,299	4,299	7.4	578	756
Power Plant	98,775	175,625	1.3	127,642	166,943
Wastewater Treatment Plant	15,093	51,422	1.30	39,555	51,738
General Plant Refuse	7,547	7,547	0.6	12,792	16,731
Total	203,974	317,153		226,468	336,056

Note: Operating capacity of all facilities is 100% after completion of Step II.

Source: United States Steel Corporation; Arthur D. Little, Inc. estimates.

Table 1-37

Summary of Information on Land-Disposed Solid Wastes

Operation	Origin of Waste	Physical Description	Oil and Grease	Heavy Metals	Other Constituents
Lime Plant	Refractories in lime kiln	Solid, small to large pieces			
	Spillage, debris	Solid, variety of sizes			CaO
Coke Plant	Refractories from furnace	Solid, small to large pieces			
Sinter Plant	Refractories from furnace	Solid, small to large pieces			
	Spillage, debris	Solid, mostly fines, sludge		Cr, Cu, Mn Pb, Zn, Ni	Steel, FeO, Al_2O_3
Blast Furnace	Refractories from furnace	Solid, small to large pieces			
	Desulfurization slag	Solid pieces from pea-size to boulders		Cr, Cu, Mn Ni, Pb, Zn	CaS, FeS, Al_2O_3, SiO_2, TiO_2 FeO, MnO, MgO
Steelmaking	Refractories from furnace	Solid, small to large pieces			
	Metal mixer dust	Solids, primarily dust and fines			*FeO, graphite flake*
Continuous Casting	Refractories from pouring vessel	Solid, small to large pieces			
Hot Strip Mill	Refractories	Solid, small to large pieces			
	Metal fines from grinding	Sludge	Yes	Cr, Cu, Mn, Ni, Pb, Zn	Al_2O_3, steel
Plate Mill	Refractories	Solid, small to large pieces			
	Metal fines grinder swarf	Sludge	Yes	Cr, Cu, Mn Ni, Pb, Zn	Al_2O_3, steel
Power Plant	Flue gas desulfurization	Sludge		Yes (depends on coal composition)	See Table 1-28
	Coal from boiler	Solid, light airy material		Yes (depends on coal composition)	See Table 1-29
Wastewater Treatment Plant	Treatment operations	Sludge	Yes	Cr, Cu, Mn, Pb	Phenols, Cn
Plant Refuse	Plant operation	Solid (combustible and non-combustible) all sizes			Paper, boxes, lunch bags, etc.

Source: Arthur D. Little, Inc. estimates.

Coke Plant

1.322

Spent refractory brick is the primary land-disposed waste from the coke plant. The high-range alumina silicate may contain traces of TiO_2, CaO, MgO, Fe_2O_3 and alkalies, depending on the raw materials used in the manufacturing process and may be contaminated with high molecular weight tars.

Sinter Plant

1.323

Solid wastes from this operation are spent refractories and debris. Refractories are similar to those found in other operations. The debris results from spillage and material unsuitable for processing for recycling.

Blast Furnaces

1.324

Land-disposed residuals from the operation of the blast furnace are spent refractories and desulfurization slag. Refractories come from the furnaces themselves as well as the ladles used for pouring the molten material. The characteristics are as described previously. Desulfurization is accomplished by injecting calcium carbide into the liquid pig iron. The chemical make-up of the slag is CaO and those elements or compounds which it removes from the ore, therefore, it contains a large portion of $CaSO_4$, and trace elements. The slag may contain the following heavy metals in concentrations of: 50 ppm Cr, 20 ppm Cu, 3,000 ppm Mn, 5 ppm Pb, and 10 ppm Zn (dry basis). The material, from small, sand-size particles to large boulder-size pieces will be alkaline in nature.

Steelmaking Operations

1.325

Refractories and dusts are the land-disposed wastes generated during the steel-making operation. Refractories line the furnace and the hot metal mixers. The dust is generated from the hot metal mixers and is mainly FeO and graphite flake and is very fine in nature. The dust may also contain heavy metals in concentrations of 100 ppm Ni, 200 ppm Cu, 3,500 ppm Zn, 7,500 ppm Pb, and 11,500 ppm Mn (dry basis) and will tend to be alkaline in nature.

Continuous Casting

1.326

The only land-disposed waste from this operation is the refractories used in the pouring vessels (called tundishs).

Hot Strip Mill

1.327

Land-disposed wastes generated from this operation are refractories, oily sludge with metal fines, and metal turnings.

Refractories are those from the furnaces in which the steel is heated prior to hot rolling. The metal fines contained in the sludge are not of sufficient quantity to warrant recovery. The oil and grease comes from leaking bearings or lubrication of backup rolls. The fines are generated during the grinding process. The sludge will be close to a neutral pH and may have a composition of 200 ppm Cr, 250 ppm Ni, 650 ppm Zn, 1,050 ppm Pb, 3,250 ppm Mn, and 45,000 ppm oil and grease (wet basis).

Plate Mill

1.328
The land-disposed solid wastes from the plate mill are like those from the hot strip mill, primarily refractories and metal fines. Refractories line the vessels used from heating the steel prior to fabrication. The metal fines, composed mainly of steel, aluminum oxide and oil and grease, result from the grinder swarf, turnings and degreasing operation. The composition of the sludge is similar to that of the hot strip mill.

Power Plant

1.329
The two-land disposed wastes from the power plant are ash and flue gas desulfurization (FGD) sludge. The major and trace components of FGD sludge are summarized in Table 1-38. Many of the components of FGD sludge have been shown to be leached from the sludge, thus requiring a lined landfill or chemical fixation of the sludge. The composition of the sludge depends on the composition of coal burned, the type of boiler and the manner in which steam is generated. The primary components (more than 80 percent of the total weight) of ashes are SiO_2, Fe_2O_3, CaO, MgO, C, and SO_3. A compilation of chemical composition of both fly ash and bottom ash from the firing of a wide range of different coals is shown in Table 1-39. Most of the elements listed are bound in matrices and are relatively difficult to leach from the waste. The principal soluble species are calcium, magnesium, potassium, sulfate, and chloride. The composition of the ashes and sludge may be affected by the fuel gas burned with the coal in the boiler. Coal fines, trace heavy metals, and traces of other constituents that have not been totally removed may appear in either of the solid, land-disposed wastes in small concentrations.

Wastewater Treatment Plant

1.330
Each unit operation at the proposed plant would have its own wastewater treatment plant. In most cases, sludges from these plants would be recycled. Those operations having treatment sludges which would be disposed on land are: sinter plant, hot strip mill, and plate mill. There are no precise data on the chemical character of these sludges, however, Table 1-40 provides a

Table 1-38

Typical Composition of FGD Slugde

Component	Range (dry weight basis)(1)
$CaSO_3 \cdot 1/2\ H_2O$	0.2-90%
$CaSO_4 \cdot 2\ H_2O$	2-82%
$CaCO_3$	0-42%
Flyash	0-70%
CaS_3O_{10}	0-10%
$CaS_2O_3 \cdot 6\ H_2O$	0-14%
$MgSO_4$	0-30%
Trace Elements	
Arsenic	3.4-63 ppm
Beryllium	0.62-11 ppm
Cadmium	0.7-350 ppm
Chromium	3.5-34 ppm
Copper	1.5-47 ppm
Lead	1.0-55 ppm
Manganese	11-120 ppm
Mercury	0.02-6.0 ppm
Nickel	6.7-27 ppm
Selenium	0.2-19 ppm
Zinc	9.8-118 ppm

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(1) Values are reported from analyses of lime, limestone fly ash, and dual alkali scrubber facilities burning coals from both the eastern and western regions of the United States (i.e., high and low sulfur coal). There are no data on FGD sludge obtained from scrubbing a power plant partially fueled by COG.

Source: "An Evaluation of the Disposal of Flue Gas Desulfurization Wastes in Mines and the Ocean," Arthur D. Little, Inc., report to EPA, EPA-600/7-77-051, May 1977.

Table 1-39

Range of Coal Ash Compositions(1)

Major Constituents (wt% on a dry basis)	
Silica (as SiO_2)	25 - 60
Alumina (as $Al_2)_3$)	10 - 30
Ferric Oxide (as Fe_2O_3)	5 - 40
Lime (as CaO)	0.5 - 25
Magnesia (as MgO)	0.2 - 8.0
Potassium Oxide (as K_2O)	0.1 - 4.0
Sodium Oxide (as No_2O)	0.1 - 4.0
Titanium Dioxide (as TiO_2)	0.5 - 2.5
Sulfur Trioxide (as SO_3)	0.2 - 20
Carbon and Volatiles	nil - 2
Selected Trace Constituents (ppm)	
Antimony	ND - 200
Arsenic	ND - 1,000
Barium	50 - 10,000
Beryllium	ND - 200
Boron	15 - 6,000
Cadmium	ND - 0.5
Chloride	---
Chromium	5 - 500
Cobalt	5 - 400
Copper	20 - 3,000
Fluoride	---
Lead	10 - 1,500
Manganese	50 - 10,000
Mercury	0.01 - 100
Molybdenum	5 - 1,500
Nickel	15 - 70
Phosphorous	5 - 10,000
Selenium	1 - 50
Thorium and Uranium	---
Vanadium	10 - 1,000
Zinc	25 - 15,000

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(1) This is a compilation of chemical composition of both fly ash and bottom ash from the firing of a wide range of coals. While the major constituents of bottom ash and fly ash are generally similar, there are usually higher levels of trace metals in fly ash than in the bottom ash.

Source: Coal Fired Power Plant - Trace Element Study, by Radian Corporation to the EPA, Volume I (TS-1a) and Volume II (TS-1b), Section I, September 1975; and "An Evaluation of the Disposal of Flue Gas Desulfurization Wastes in Mines and the Ocean." Initial Assessment Report by Arthur D. Little, Inc. to the EPA under Contract 68-03-2334. EPA Publication Number EPA-600/7-77-051, May 1977.

Table 1-40

Possible Sludge Compositions from Wastewater Treatment Plants

Component	Concentration (ppm) (wet basis) Range	Average
Cr	11 - 1,200	275
Cu	3 - 550	170
Mn	1 - 9,800	3,525
Ni	10 - 780	225
Pb	10 - 4,000	415
Zn(1)	5 - 70,000	9,650
F	420 - 4,500	1,250
Oil and Grease	34,000 - 220,000	106,300

Values are from analyses of sludge samples each from wastewater treatment plants at four steel mills.

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(1) High zinc values would not be applicable at the proposed plant, since no purchased scrap would be used.

Source: Calspan, "Assessment of Industrial Hazardous Waste Practices in Metal Smelting and Refining Industry," EPA No. 68-01-2604, April 1977.

broad range of levels within which the waste composition might fall.

Sinter Plant

Oil and suspended solids are removed from waters required by the wet electrostatic precipitator for cleaning the exhaust gases from the wind box. Sludge from neutralization and clarification contains solids from the sinter plant process, oil, line, and flocculant aids (if used).

Hot Strip Mill and Plate Mill

Direct contact water, used in both mills, picks up oil and grease and suspended solids. After recovery of coarse mill scale for recycle, the water is filtered. Sludge from filter backwashing contains fine scale. Approximately 30 percent of the particles in the sludge are less than 74 microns in diameter.

General Plant Operation

1.331

Refuse from the operation of the plant, both combustibles and noncombustibles, will be disposed of on land. This refuse would include general wastes consisting mostly of packaging materials such as paper, box-board, and wood. The pollution control residuals which would comprise a large portion of the land-disposed wastes would be typically fine grained and wet. Depending on analytical methods promulgated under the Federal Resource, Conservation, and Recovery Act (RCRA), these wastes will be individually classified as either hazardous or nonhazardous. Therefore, two disposal areas will be provided for fine-grained wastes, one conforming to the stringent hazardous waste requirements, the other for nonhazardous substances. Due to the small particle sizes expected and general physical instability, these wastes would be specially handled to avoid wind and water erosion. In addition, the extensive surface area of these particles enhances leachate potential and subsequently requires precautions to avoid contamination of groundwater and surface water. On the basis of these characteristics, line impoundment is considered the most suitable method of disposal. Wastes which are relatively dry and large would comprise the bulky waste category. The most feasible of handling will be by stockpile or traditional landfill operation where a dozer/compacter is used to consolidate the waste in layers. Impoundment is not required for slope stability because of the stable physical characteristics of this material. Refractories are separately categorized because of the chemically inert, physically stable nature of these wastes.

Furnaces and ovens are routinely relined with refractories as portions of the lining disintegrate. There is no buildup of iron and

steel on the refractories to be disposed. After the plant goes on line, these wastes may be used as fill in the unused portions of the Turkey Creek ravine, or during the construction of cellular steel sheet pile bulkheads. Based on the start-up time of the various unit operations indicated in Tables 1-35 and 1-36, the disposal site capacities for phased generation of fine-grained, bulky, and refractory wastes have been estimated. These findings are presented in Tables 1-41 and 1-42.

d) Types of Disposal Sites

1.332
A description of the three potential types of disposal sites that will be used at the proposed plant is presented below.

On-Land Disposal - Much of the proposed Lakefront Plant site consists of till in which the permeability has been estimated to be equal to or less than 10^{-8} cm/sec. These soils serve as an impermeable barrier between the surface and underlying groundwater and, therefore, will be left intact during construction of on-land disposal sites. Wastes will be deposited in layers covered daily with soil cover and compacted. If garbage and other readily biodegradable (putrescible) organics are omitted from the on-land disposal area, daily soil cover may not be required by the Pennsylvania Department of Environmental Resources. Slopes will be restricted in accordance with Pennsylvania Department of Environmental Resources Chapter 75 Rules and Regulations. Runoff and leachate would be collected by drains and treated by sedimentation basins. Additional treatment, such as mechanical aeration or coagulation, is not currently deemed necessary but may be applied as needed.

1.333
Lined Impoundment Disposal - There are no potable groundwater supplies onsite or down-gradient of the site, therefore, disposal sites which recharge the strand deposits or creeks onsite will be lined with impermeable (less than 10^{-7}/cm/sec) material. (1-8) Further impoundment areas, if not naturally depressed, would be excavated, graded, and diked. Provisions will be made to divert surface runoff and drain groundwater from the impoundment area and to collect decant water within the impoundment.

1.334
Clean Fill Disposal - Certain areas could be used for the disposal of residuals which are considered by the Pennsylvania Department of Environmental Resources to be clean fill (chemical analysis of actual waste samples and leachate column tests on representative samples

Table 1-41

Distribution of Land-Disposed Residual at the Proposed Lakefront Plant -- Step I

Waste Group	Estimated Annual Value (wet basis)		Estimated Annual Value Required	
	M^3	Yd^3	Hectares	Acres
Fine grained solid wastes (lime debris, sinter plant debris, hot metal mixer dust, roll grinder swarf, SO_2 scrubber sludge, ash, wastewater treatment plant sludge)	99,940	130,700	2.0*	4.9
Bulk, solid wastes (blast furnace desulfurization slag, general plant refuse)	17,970	23,500	0.4**	0.9
Refractories	13,570	17,750	0.3***	0.7

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*Assumes disposal in a 5-meter-deep lined basin with decant collection and treatment.

**Assumes on-land disposal (*15% slope limitation*) with drainage collection and treatment (employing the insitu impermeable glacial till as a barrier to protect ground water) and daily soil cover, as needed. The areas required to not include the potential soil cover, which typically is applied in a soil to waste ratio of 1:4.

***Assumes disposal in the Turkey Creek ravine which averages 5 meters.

Source: Arthur D. Little, Inc. estimates.

Table 1-42

Distribution of Land-Disposed Residuals at the Proposed Lakefront Plant -- Step II

Waste Group	Estimated Annual Volume (wet basis)		Estimated Annual Area Required	
	M^3	Yd^3	Hectares	Acres
Fined grained solid wastes (lime debris, sinter plant debris, hot metal mixer dust, roll grinder metal fines, grinder swarf, SO_2 scrubber sludge, ash, wastewater treatment plant sludge)	168,500	220,200	3.4*	8.4
Bulk, solid wastes (blast furnace desulfurization slag, general plant refuse)	31,000	40,700	0.6**	1.4**
Refractories	23,400	30,400	0.5***	1.2***

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*Assumes disposal in a 5-meter-deep lined basin with decant collection and treatment.

**Assumes on-land disposal (15% slope limitation) with drainage collection and treatment (employing the in situ impermeable glacial till as a barrier to protect groundwater) and daily soil cover, as needed. The areas required do not include the potential soil cover which typically occurs in a soil to waste ratio of 1:4.

***Assumes disposal in the Turkey Creek ravine which averages 5 meters.

Source: Arthur D. Little, Inc. estimates.

would be accomplished by the applicant after plant start-up to confirm which wastes would qualify as clean fill). At this time, spent refractories are expected to be inert at normal temperatures. The high temperatures to which these residuals have been exposed suggest that their structure is fairly uniform aluminum silicate complex network in which traces of metal oxides may exist as ions deeply imbedded by diffusion at high temperature.

1.335
Generally, the three types of sites discussed above would be used for the three types of wastes outlined earlier and quantified in Tables 1-41 and 1-42. In summary, the site and waste categories would be grouped as follows:

- on-land disposal--bulky wastes
- lined impoundment disposal--fine grained wastes
- clean fill--spent refractory brick

Description of Potential Disposal Sites

1.336
Eight areas were identified as conceptually viable for solid waste disposal. The sites were identified using onsite boring, test pit, and groundwater well data. A description of each site and its suitability for solid waste disposal is presented below. A site map depicting the location of each potential disposal site is shown in Figure 1-30. The total annual wet volume requiring disposal would be as much as 217,384 cubic meters when the proposed facility is operating at full capacity. The seven areas appearing viable for land disposal are capable of handling more than twice this amount of waste over the life of the plant. Combined, the area of all sites is equal to 370 hectares (914 acres) while less than five hectares (12 acres) would be required in any year of operation.

Area 1 - 34 Hectares (84 acres) -- The area is underlain entirely by till with a small area of strand deposits downgradient, straddling the Conrail right-of-way. The strand deposits are completely isolated and are not considered to be an aquifer. Placement of waste of low permeability on the southern half of the site is not desirable since a build-up of leachate within the fill could produce a mounding effect leading to movement of leachate into the strand deposits south of the Norfolk and Western Railroad right-of-way. The site would be viable for both on-ground disposal and lined impoundment disposal.

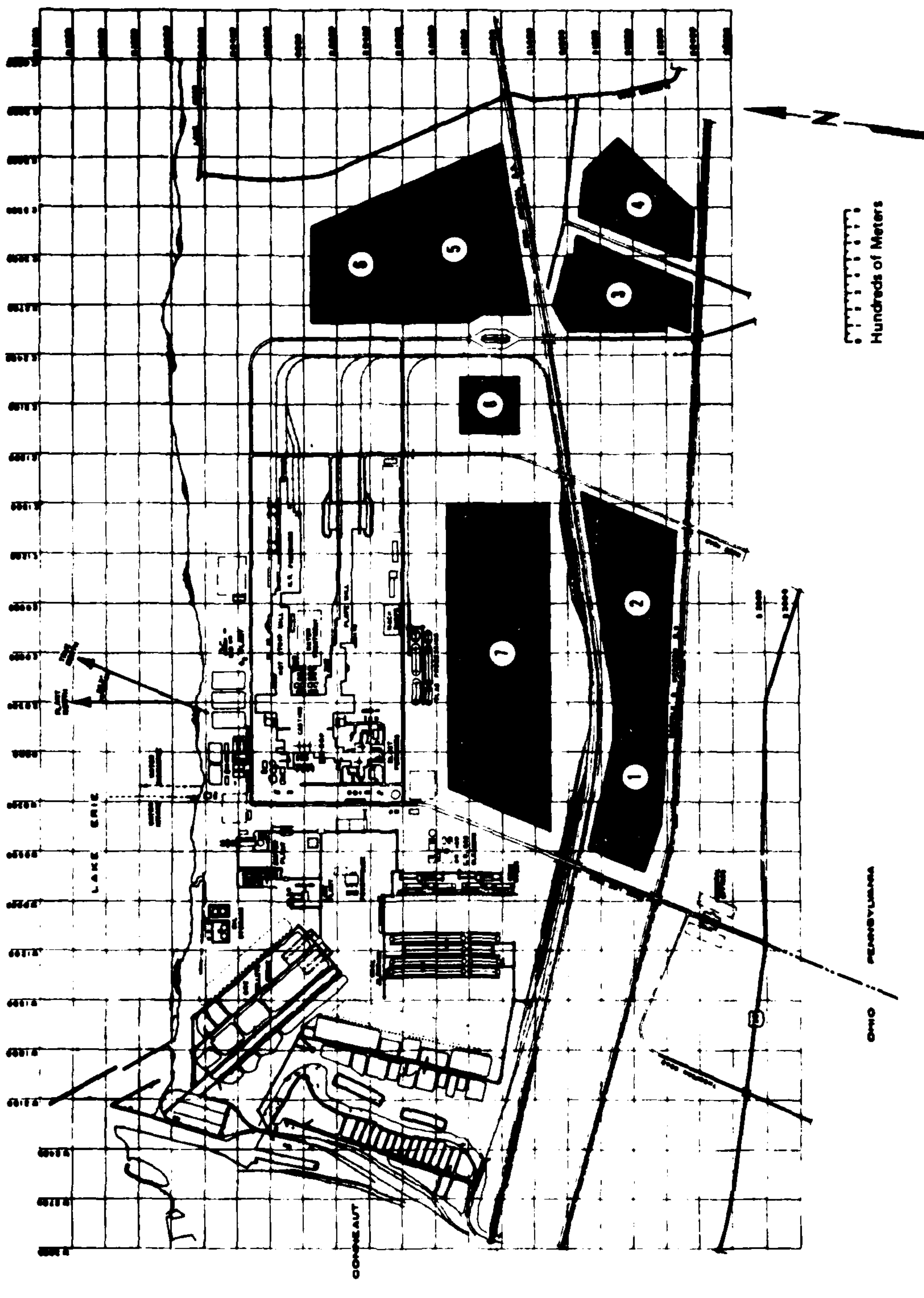


Figure 1-30 AVAILABLE ON-SITE SOLID WASTE DISPOSAL AREAS

Area 2 - 47 Hectares (116 acres) -- The soil profile of this area consists of lacustrine deposits underlain by till. However, some portions of the southern boundary are underlain only by till. Since there will be some undetermined amount of subsurface drainage into the existing Turkey Creek, the applicant will conduct additional test borings to better define the restrictions which should be placed on the use of this site. If these appreciable quantities of leachate would drain through the creek channel, usage would be restricted to lined impoundment, or open disposal of clean fill.

Area 3 - 32 Hectares (79 acres) -- This site is entirely underlain by till and is well-removed from any strand deposits. Thus it is well-suited for and perhaps the best available area for on-land disposal, with the undisturbed till acting as an impermeable barrier between the waste and the groundwater. It is also suitable for lined impoundment.

Area 4 - 34 Hectares (84 acres) -- Site characteristics are similar to those of Area 3, however, the strand deposits to the northeast, which drain into Raccoon Creek, make it necessary to carry out a careful exploratory boring program to ensure that there is no significant hydraulic connection. Strand deposits are also located along the southeastern boundary, so disposal operations in this area will be restricted to lined impoundment. The site appears suitable for either on-land disposal (with some restrictions subject to further geologic study) or lined impoundment.

Area 5 - 88 Hectares (217 acres) -- This area has potential for both lined impoundments and on-land disposal. Since there are extensive strand and lacustrine deposits in the southern portion of this site, approximately 60 hectares (148 acres) may be used only for lined impoundments. The remaining 28 hectares (69 acres), which are underlain by till, are suitable for on-land disposal.

Area 6 - 35 Hectares (86 acres) -- The level portions of this site cover about 20 hectares (49 acres), which is underlain entirely by till, could be used either for on-land disposal or for lined impoundment. The remaining 15 hectares (37 acres) are in the valley of an unnamed creek, which could be used as a lined impoundment by constructing a dam across it (such action will be subject to further investigation). There appears to be no geologic restrictions relative to placement of clean fill in this area.

Area 7 - 100 Hectares (247 acres) -- This area includes a major portion of the Turkey Creek ravine, with the flat portions of the site underlain by lacustrine deposits. The area could be used for disposal by lined impoundment.

Area 8 - 12 Hectares (27 acres) -- This area is underlain by till and lacustrine deposits and includes some shallower portions of Turkey Creek. Strand deposits to the north are isolated from this site. In general, the area appears to be a suitable location for the disposal of refractories.

1.337
Selection criteria used by the applicant to evaluate each of the eight landfill sites include type of waste material, groundwater protection, distance from Lake Erie and other surface waters, and avoidance of sensitive terrestrial and aquatic ecosystems. The sites best fitting these requirements and selected for solid waste disposal by the applicant are listed below.

- Area 7 - lined impoundment to contain fine grained wastes,
- Area 3 - on-land disposal of bulky wastes, and
- Area 8 - clean fill with refractories.

1.338
However, the original proposal to fill and divert Turkey Creek has been extensively modified by the applicant. Under the new plan, Turkey Creek would be left in its natural state except for a section between State Line Road and Lake Erie that would be culverted. In addition, designated aquatic and terrestrial habitat areas within the Lakefront site would be managed to increase fish and wildlife productivity. The details of this proposal are described elsewhere in this chapter.

1.339
The three areas preferred by the applicant for solid waste disposal conflict with the fish and wildlife mitigation plan for the Lakefront site and as such are no longer considered viable. In view of this fact, the applicant intends to identify and evaluate potential sites for solid waste disposal within that portion of the Lakefront plant site that would actually be developed. The criteria for site selection and evaluation would be based on the type of waste material, potential for groundwater contamination, distance from Lake Erie and other surface waters, and the proximity of sensitive terrestrial ecosystems.

1.340
Approximately 298 hectares (736 acres) of the developed portion of the plant site would consist of open areas either covered with slag or seeded, while another 150 hectares (371 acres) in the eastern access area consists of uncleared or ungraded land (refer to Table 1-43). Based on inspection of the tentative site plan, the applicant

Table 1-43

Plant Area Land Use by Function

Area Name		Acreage	
Steelmaking and Mills			511
Roofed area		115	
Roads		40	
Rails		8	
Miscellaneous developed land		40	
Water treatment		13	
Parking lot		11	
Slag/grass	(189/95)	284	
Ore Blending, Sinter and Lime Plants, Powerhouse			188
Roofed area		5	
Roads		5	
Parking lot		6	
Miscellaneous developed land		3	
Slag/grass	(85/84)	169	
Coke Ovens and By-Products			138
Roofed area		5	
Roads		11	
Slag/grass	(82/40)	122	
Coal Blending			77
Coal piles and conveyors		50	
Slag/grass	(18/9)	27	

Table 1-43 (Continued)

Area Name		Acreage	
Water Treatment and Oxygen Plants			124
Roofed area		3	
Parking lot		10	
Miscellaneous developed land		5	
Ponds		20	
Slag/grass	(32/54)	86	
Oil Storage Area			24
Diked area		6	
Slag/grass		18	
Eastern Access Area and Slag Processing			471
Parking lot		7	
Slag processing and storage		30	
Roads		20	
Rail		13	
Slag/grass	(20/10)	30	
Uncleared/ungraded		371	
Miscellaneous Uncleared and Ungraded			89
Undeveloped			1134
Total Plant Area			2756

Note: Solid waste disposal sites have not been proposed. If not available offsite, these sites would be located in the land uses designated as slag/grass, uncleared/ungraded, or undeveloped, in one or more of the following areas: steelmaking and mills; ore blending, sinter, and lime plants, powerhouse; coke ovens and byproducts; water treatment and O_2 plants; eastern access and parking; miscellaneous uncleared and ungraded; or undeveloped (not including the Turkey Creek "greenbelt" area).

Source: Arthur D. Little, Inc.

estimates that half of the total surface area of both land tracts could be made available for solid waste disposal. The remaining acreage could not be used because of building and utility access needs, interference with overhead construction, proximity to the lake shoreline, or the relatively small size of individual land parcels. Further, the applicant has also assumed for the purposes of this analysis that any given disposal area would be large enough in size to contain the solid waste produced during a one-year period. On this basis, there appears to be sufficient land available to meet the annual need of 4.5 hectares (11 acres) for all types of solid waste. In addition, the applicant estimates that ample room would be available even if the acreage requirement were doubled to allow for buffer zones and multiple small size landfill sites.

1.341
If for some reason the use of the developed portion of the plant site was not considered feasible or offsite landfills were not available, the applicant would dispose of solid wastes at other locations within the Lakefront site. Since some of these areas consist of wetlands or other types of wildlife habitat, migration measures would have to be employed. These could include the use of separate lined impoundments for nonhazardous fine grained materials, hazardous fine grained materials, and bulky wastes. A fish and wildlife habitat management plan similar to the one already designed for the Lakefront site could be employed to ameliorate the associated environmental impacts. Wastes which the Pennsylvania Department of Environmental Resources would consider to be clean fill, based on chemical analysis and leachate column tests of actual waste samples taken after plant start-up, would not be impounded.

1.342
The site surveys performed by the applicant's consultant Geraghty and Miller, Inc. and D'Appolonia/Haley and Aldrich, are considered sufficient for the purpose of evaluating alternative solid waste disposal sites. However, more detailed hydrogeologic surveys of prospective areas, including borings would be undertaken during the disposal area design phase. During this process, the applicant would also be required to conform to the site selection and construction requirements set forth in the Resource Conservation and Recovery Act.

1.343
The applicant has stated that those impoundments requiring a liner would be sealed with a material that is compatible with the type of wastes disposed. Selection of the appropriate type of liner would be guided by climatic conditions, cost and availability of materials, site preparation requirements, and the physical-chemical character of the waste involved. Liners presently available include asphalt, clay, concrete, plastic, rubber, or any combination thereof (1-9).

The high oil and grease levels expected in certain sludges would preclude the use of asphalt just as the high alkalinity of the mixed waste streams would limit the effectiveness of clay as a sealing material. Concrete liners are not appropriate in some instances, due to the high concentrations of sulfate and sulfide in certain wastes. Rubber liners are considered unsuitable because of the short life span and the potential for weather-related deterioration. Plastic liners may represent a suitable alternative although sampling and analysis of the solid wastes would be necessary to determine overall compatibility. A list of the expected wastes and their compatibility with the various types of available liners is shown in Table 1-42.

1.344
Chemical treatment may be required for certain sludges if they are classified as hazardous under the criteria set forth in the Resource Conservation and Recovery Act. This process can retard certain types of pollutant migration from a waste to its surrounding environment. Normally, the procedure used involves admixing materials with the wastes, so that the surface area-to-volume ratio is decreased by formation of a solidified mass (1-10). The need for chemical treatment and the choice of an appropriate method would depend on the chemical analysis and leaching test results for representative sludge samples.

1.345
Supernatant from the lined impoundment and runoff from on-land disposal sites would be collected and treated. Based on the volumes and types of wastes described earlier, the combined effluent would be expected to have a low oxygen demand, high alkalinity level, low oil and grease content, and high dissolved solids levels. Under these circumstances, appropriate treatment would include sedimentation and additional control as necessary to meet NPDES permit requirements.

1.346
Waste disposal areas would be frequently monitored by the applicant and the appropriate regulatory agencies to insure that there are no problems with the structural stability of the impoundment or the integrity of the liner (1-11). Monitoring would include the collection of groundwater samples from one upgradient well and several downgradient wells in the vicinity of each disposal site. Testing would then be conducted to determine which leachate indicators (i.e. chloride, sulfate, sodium, or bicarbonate, etc.) should be monitored on a regular basis. Analysis for other constituents would only be performed in the event that leachates are detected downgradient of a particular disposal site.

1.347
As an alternative to the above, the U.S. Steel Corporation could contract with private operators for the removal and proper disposal

of solid wastes generated by the proposed plant. These individuals would be responsible for the safe transportation of waste materials to designated disposal areas that would be managed in accordance with applicable Federal, State, and local regulatory requirements. The applicant has already entered into such an agreement at other steel manufacturing facilities and is exploring the possibility of a similar arrangement at the Lakefront site. However, the availability of Contractors capable of providing this type of service is only speculative at this time.

OFFSITE SUPPORTING FACILITIES

1.348
Fully integrated steel plants such as the type proposed generally require offsite supporting facilities to provide raw materials, consumable supplies, replacement parts, and back-up services to supplement onsite capabilities. The applicant has geared the design of the proposed plant and its onsite facilities toward maximizing self-contained support. Consequently, the U.S. Steel Corporation projects that no new offsite support facilities will be required to operate the proposed plant.

OTHER ACTIVITIES REQUIRING A DEPARTMENT OF THE ARMY PERMIT

1.349
The United States Steel Corporation has applied for a Department of the Army permit to: construct a cooling water pipeline and intake structure and discharge water pipeline and diffuser in Lake Erie; extend the Conneaut Harbor East Pier; construct an unloading dock which will join the extended East Pier; dredge the area immediately adjacent to the dock structure; install a raw materials conveyor system which will span the harbor between the shore terminus of the dock and the existing shoreline; and culvert Turkey Creek between State Line Road and a point 1,500 feet upstream of Lake Erie. The pier extension and new dock construction will be of the "open pier" type design. A general map showing the location of each activity in relation to the proposed Lakefront site is presented in Figure 1-31. The extension of Conneaut Harbor East Pier, construction of the new docking facility, the raw materials conveyor system, and associated dredging were discussed previously in the section entitled, "Raw Materials Handling."

Intake Structure

1.350
Water to supply the requirements of the proposed steel plant will be withdrawn through a set of 12 intake heads located about 1,524 meters (5,000 feet) offshore in Lake Erie. Figures 1-32 and 1-33 show the proposed design and location of the intake structure. The current conceptual design indicates an intake location about

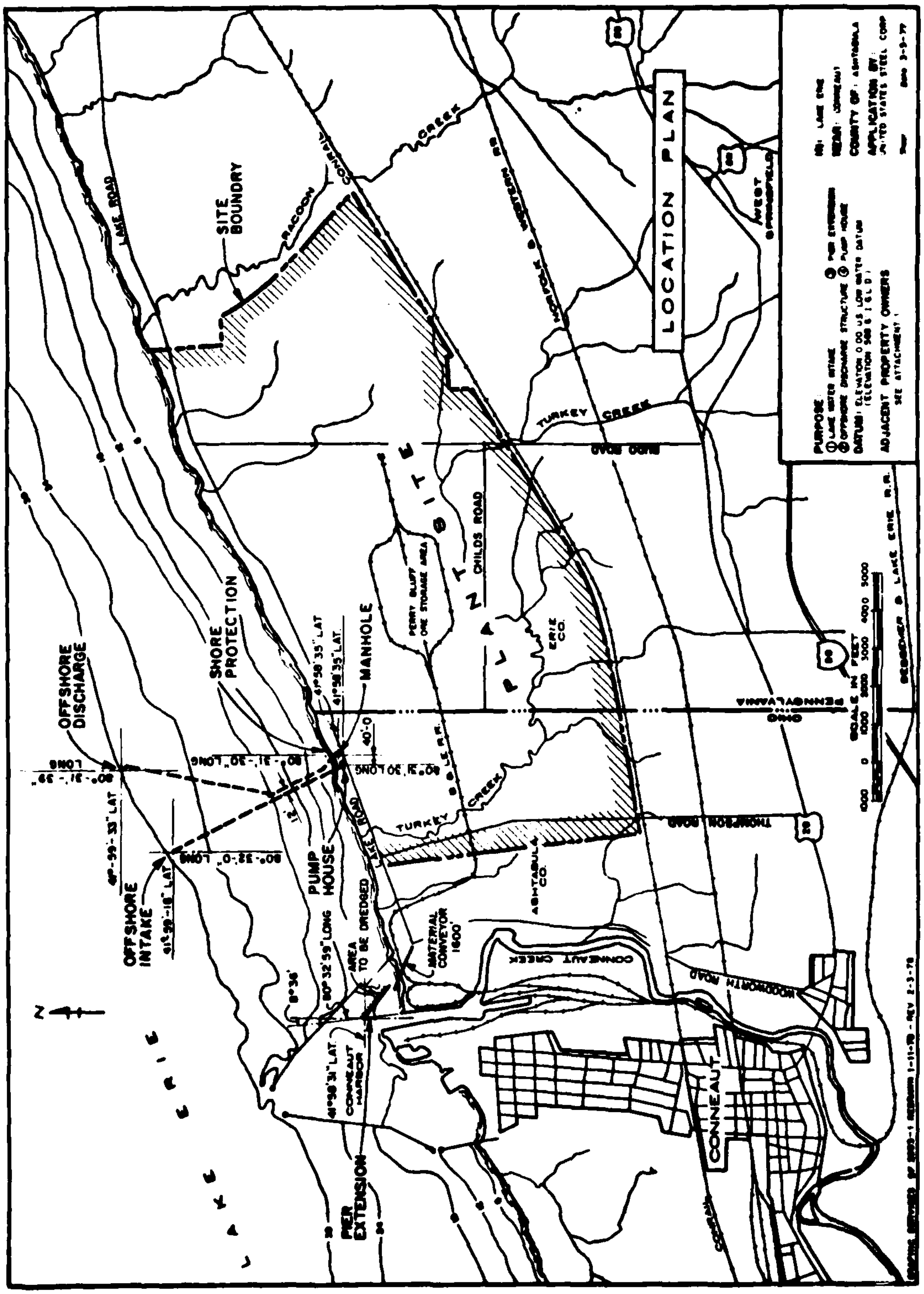


Figure 1-31 Location Plan

Figure 1-32 Design Original Intake

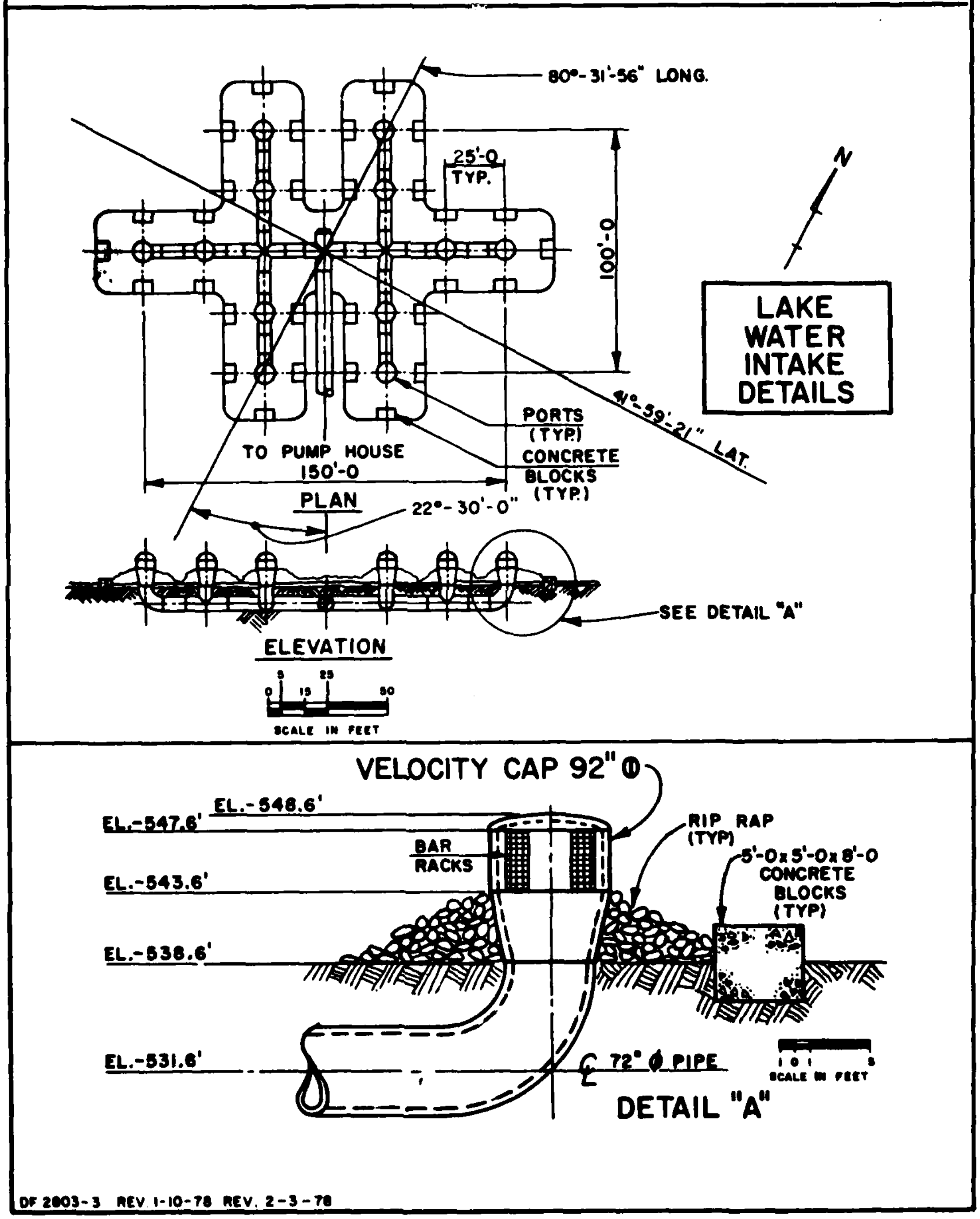
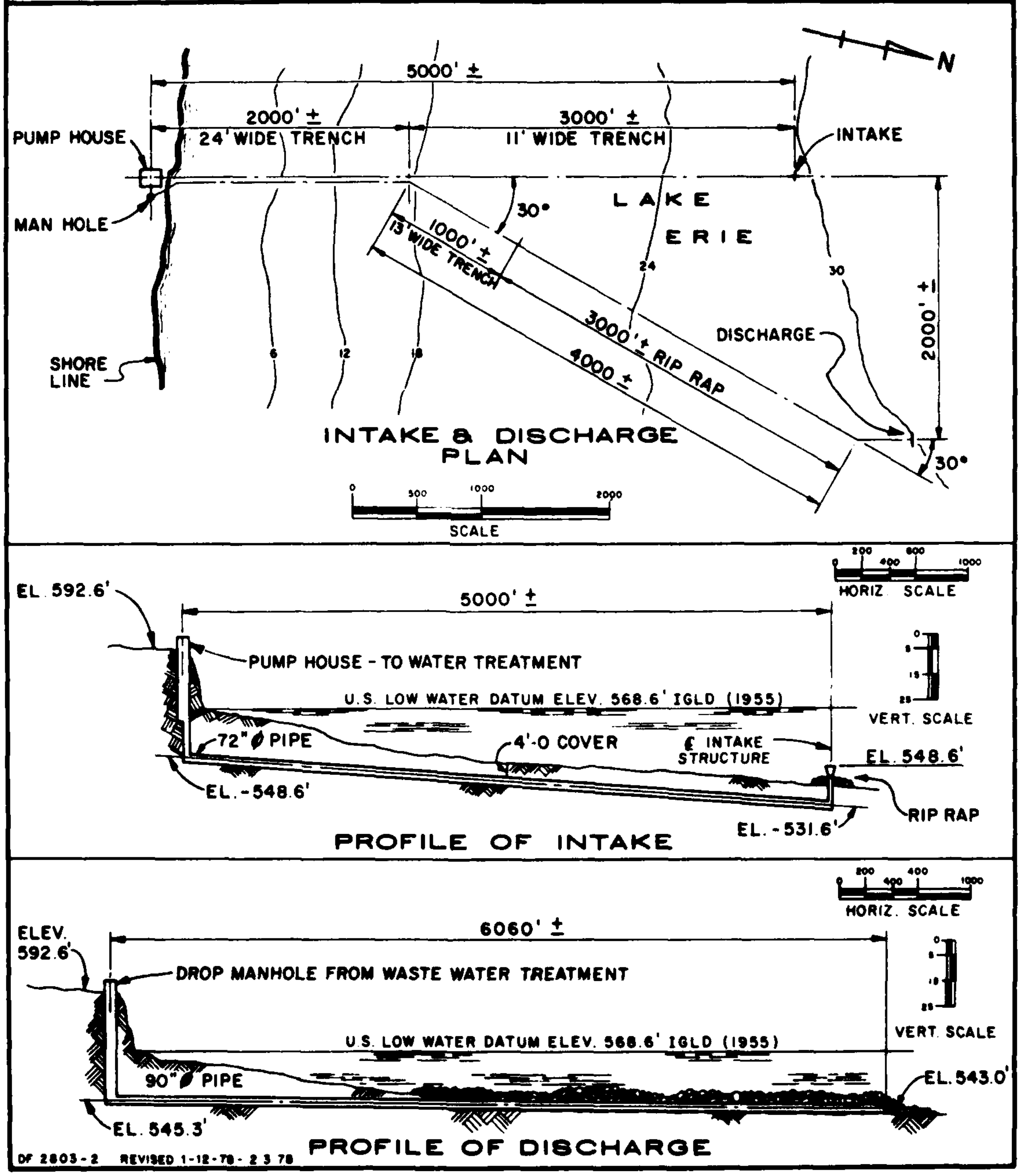


Figure 1-33 Pump House, Intake and Offshore Discharge



5,000 feet offshore at the 30-foot depth contour. However, the final location will be determined, at a later date, through the NPDES permitting process. In this regard, the applicant has agreed to perform additional ichthyoplankton sampling to be used in determining a location which will minimize fish egg and larvae entrainment. The USEPA has advised the Corps that the additional data will be reviewed prior to final approval of the intake.

1.351
Essentially, the intake structure consists of a cluster of interconnected intake heads. Each intake head is 2.34 meters (92 inches) in diameter and contains four square intake ports measuring about 1.22 meters by 1.22 meters (4' x 4') in size. The lower edge of each intake port is about 1.5 meters (5 feet) from the lake bottom, while the distance from the top of each intake head to the lake bottom is 3.0 meters (10 feet). A minimum clearance of 6 meters (20 feet) below low water datum elevation 170.6 meters (568.6 feet) (IGLD, 1955), will be maintained over each of the twelve intake heads. The applicant's original conceptual design as shown on Figure 1-32 included a velocity cap on each intake head and individual intake ports fitted with bar racks which provide 5 x 5 centimeter (2 inch x 2 inch) openings. Comments submitted to the Corps of Engineers by the USEPA advised that the applicant's original design does not minimize impingement of fish. The EPA indicated that wedge wire screens with minimum practicable openings currently represent the Best Available Technology for minimizing adverse effects and should be utilized by the applicant. On 9 January 1979, the applicant advised the Corps in writing that Best Available Technology (BAT) which has been demonstrated to be practicable will be incorporated in the final intake design. Therefore, wedge wire screens, or an equivalent proven technology, will be installed if these screens are still defined as BAT during the detailed design phase of the project. The final intake design would be determined as a function of the NPDES permitting action not the Department of the Army permit. The installation of wedge wire screens may required slight modifications to the design of each intake head.

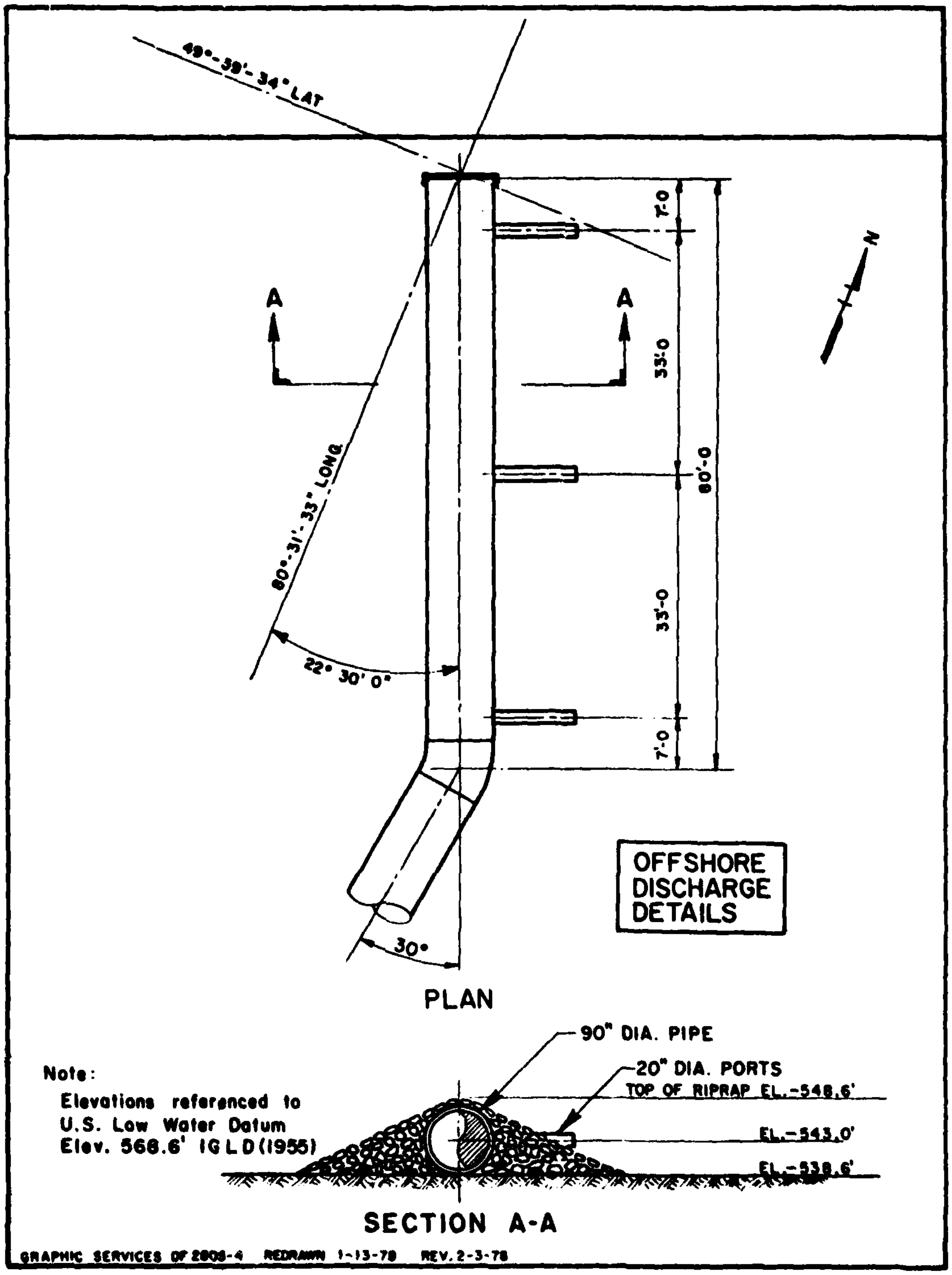
1.352
Construction of the intake system will be accomplished by dredging a trench in the bottom of Lake Erie about 1,524 meters (5,000 feet) in length, 3.35 meters (11 feet) in width, and between 1.22 meters (four feet) and 3.35 meters (11 feet) in depth depending on the location of the pipeline. This will require dredging of about 27,678 cubic meters (36,000 cubic yards) of material. A total of 6,499 cubic meters (8,500 cubic yards) of fill will be distributed over the intake as follows: 382 cubic meters (500 cubic yards) of rock and concrete block around the intake cluster to provide stability and 6,117 cubic meters (8,000 cubic yards) of rock riprap

in the vicinity of the low water shoreline as shore protection. The intake cluster will connect to the onshore pumping system via a 1.8 meter (72-inch) diameter pipeline installed in the 1,524 meter (5,000 feet) long trench. Water will be withdrawn from Lake Erie in a horizontal flow direction through the intake ports at a rate of 14,800 cubic meters (19,240 cubic yards) per hour. The mean intake velocity is 0.079 meters (0.26 feet) per second. Maximum approach velocity at the center of the port should not exceed 0.166 meters (0.55 feet) per second.

1.353
Some modification of approach velocities may be required due to installation of wedge wire screens. Based on previous experience at the Gary Works in Indiana, the applicant intends to construct the intake by excavating sections of trench with a clamshell bucket long enough to emplace single pipe sections. During this operation dredged material will be excavated and stored on a barge until such time as the pipe section is place. The dredged material will then be used to backfill the trench to the original bottom elevation. Preliminary bottom sampling by the applicant indicates that rock lies near the surface on the lake bottom in the vicinity of the proposed shore crossing. If these findings are substantiated during detailed design studies, then blasting will be necessary to break up the bottom and allow trenching by a clamshell or dragline. It is likely that installation of the shoreline crossing will require the use of a coffer dam during construction. Once construction is completed, riprap will be placed in this area to provide erosion protection. Construction of both of the intake and outfall system pipelines will probably be completed during a single lake work season (April through November) and would require approximately 50 men, a lay barge, three storage barges, and the lay barge). Construction will be phased to complete all components of the water supply/discharge system by mid-1982, when various components of the steel plant become operational.

Outfall Structure
1.354
The proposed effluent discharge system consists of a multiport diffuser located about 1,615 meters (5,300 feet) offshore in Lake Erie. Figure 1-34 displays the location and conceptual design of the proposed discharge system. The diffuser is located at approximately the 9.14 meter (30-foot) bottom contour and connects to the site via a 2.29 meter (90-inch) diameter pipeline. Approximately 13,000 cubic meters (17,000 cubic yards) of riprap will be required to protect the exposed portion of the discharge pipe and diffuser. Three discharge ports are provided for the multiport diffuser, each port having a diameter of 0.5 meter. Individual discharge ports or nozzles are located 10 meters apart on center and are oriented

Figure 1-34 Offshore Discharge Details



toward the east. The discharge flow is designed to be horizontal to the lake bottom and parallel to the shoreline. A distance of 1.3 meters (52.5 inches) is provided between the lake bottom and the discharge port centerlines. Riprap protection will be placed on top of the diffuser and the distance between the top of the riprap and the lake bottom is estimated to be 3.0 meters (10 feet). Pipeline connecting the diffuser to the site will be placed in a trench dredged in the lake bottom. Conceptual design data indicate that the trench will be 1,620 meters (5,400 feet) in length, 3.88 meters (12 feet, 9 inches) wide and will vary in depth between 2.26 meters (7.5 feet) and 4.57 meters (15 feet). Approximately 27,984 cubic meters (36,600 cubic yards) of material will be dredged to facilitate construction of the diffuser and discharge pipeline. The discharge pipeline will be placed parallel to the intake pipeline from the shoreline to the 5.48 meter (18-foot) contour at which point the discharge pipe proceeds to the northeast of the intake pipeline at about a 30-degree angle. The last 20 meters of the discharge pipeline will then proceed perpendicular to the shoreline and end at the multiport diffuser.

1.355
At maximum combined cooling tower blowdown and maximum process water discharge, the discharge flow rate will be 11,100 cubic meters per hour. The discharge velocity if projected to be 3.96 to 4.87 meters per second (13 to 16 feet per second). The diffuser will be located about 609.6 meters (2,000 feet) from the intake structure. The shoreline area where the intake and discharge pipelines enter the lake will be protected with about 100 to 200 feet of riprap. The construction methodology for construction of the discharge system is similar to that described for the intake system. A technical discussion of the rationale for discharge structure location and design is appended to this statement.

1.356
The USEPA has recently raised some concern about the proposed diffuser's performance under zero flow conditions. Prior to final NPDES approval of the discharge structure, the USEPA is required reevaluation of zero flow conditions. This reevaluation could result in a final diffuser design which includes additional discharge ports, or a slightly different configuration and orientation from the conceptual design described in this final EIS.

Shoreline Protection

1.357
Based on the present rate of erosion of the bluff fronting the proposed plant, the applicant indicates that some general type of erosion protection will be required. At this time, the applicant has not determined how much or what type of shore protection will be

used and it is likely that such information will not be available until the detailed engineering design for the proposed plant is worked out. Thus, installation of shore protection in this area will be the subject of a future Department of the Army permit action.

CONSTRUCTION ACTIVITIES INVOLVING TURKEY CREEK

1.358
During the review period for the draft EIS, a number of comments were received opposing the applicant's proposal to fill and divert Turkey Creek. The majority of the concerns expressed by the agencies and the general public centered on the loss of productive aquatic habitat in Turkey Creek, impairment of surface drainage due to the inability of the interceptor channel to carry stormwater, and the reduction of water quality in Conneaut Creek through the input of sediment-laden waters and plant runoff from the diversion channel. In response to these concerns, the applicant decided to reject the original proposal and adopt a new plan which calls for the culverting of a portion of Turkey Creek and the elimination of the diversion channel. For comparative purposes, both plans are described in this section, while comments relating to either proposal are appended to this Final Environmental Impact Statement.

Original Proposal

1.359
The applicant's original plan involved the filling of Turkey Creek with excavated earth between Lake Erie, and a point 1.2 kilometers (0.75 mile) upstream. To accomplish this task, the required fill would be obtained from the oil storage area, lime plant, sinter plant, coke battery, and coke by-product plant construction sites. Approximately 104,000 cubic meters (80,000 cubic yards) of fill would be needed although some areas could require more to achieve project grade. A map showing those portions of Turkey Creek that would be filled under the original plan is presented in Figure 1-35.

1.360
Under this proposal, drainage in the old streambed would be maintained either through the use of gravel bedding under the fill or, more likely, by the installation of a drain pipe prior to construction. The majority of the creekbed and adjoining ravine above the earthen fill would be used for the disposal of solid wastes generated during plant operations.

1.361
In conjunction with this plan, a stormwater interceptor channel (diversion channel) would be constructed to effect the drainage of the unfilled portions of Turkey Creek. The proposed channel would

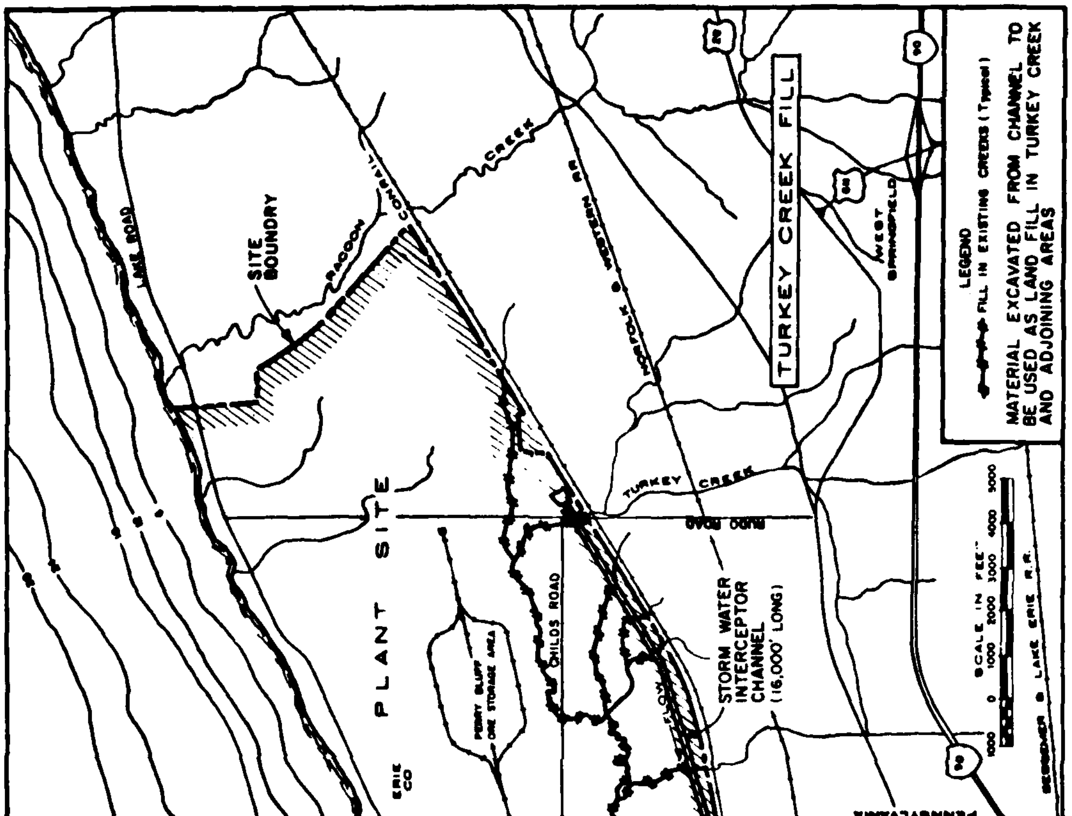


Figure 1-35 Turkey Creek Fill

extend westward from Rudd Road to Conneaut Creek and would be approximately 16,000 feet long, 44 feet wide, and about 6 feet deep. To alleviate erosion, an energy dissipation system would be installed at the downstream end of the diversion channel where it undergoes a sharp drop in elevation. The location and design of the diversion channel is shown in Figure 1-36.

Current Proposal

1.362

Under this plan, the applicant proposes to culvert Turkey Creek between State Line Road and a point approximately 460 meters (1,500 feet) upstream of Lake Erie. Installation of the culvert would be accomplished by clearing and grading the existing streambed, placing precast concrete pipe sections in the prepared channel, and backfilling to project grade. Construction would be completed during the summer months when low flow conditions prevail and there is little potential for interference with spawning runs of Lake Erie fish species. The culvert would have an inside diameter of 3.66 meters (12 feet) and is expected to provide adequate drainage during a 100-year flood event. Approximately 7,500 feet of streambed would be altered to effect the installation of a culvert 5,600 feet in length. The difference of 1,900 feet accounts for the straightening of bends and meanders in the main sstem and tributaries of Turkey Creek affected by this proposal. A map showing the general location of the culvert is presented in Figure 1-37.

1.363

The length of the proposed culvert, coupled with the absence of pools and protected areas, may determine upstream migration of Lake Erie salmonids during optimal high flow periods. To resolve this problem, the applicant proposes to install a system of baffles and resting pools at strategic locations and a skylight system which will provide subdued lighting along the entire length of the culvert. The exact location and design of these structures will be determined by the applicant in cooperation with the appropriate Federal, State, and local agencies. Diagrams illustrating the profile of the proposed culvert and the typical configuration of the baffle system, resting pools, and skylights are shown in Figures 1-38(a) and 1-38(b).

1.364

The low flow characteristics of Turkey Creek present a formidable barrier to salmonid migration under both natural and project-related conditions. Recognizing this problem, the applicant plans to augment the flow of the creek during peak migration periods by diverting a portion of the plant intake water into the upstream end of the culvert. Flow augmentation on a year-round basis is also expected to decrease summer temperatures and increase winter

Figure 1-36 Interceptor Channel

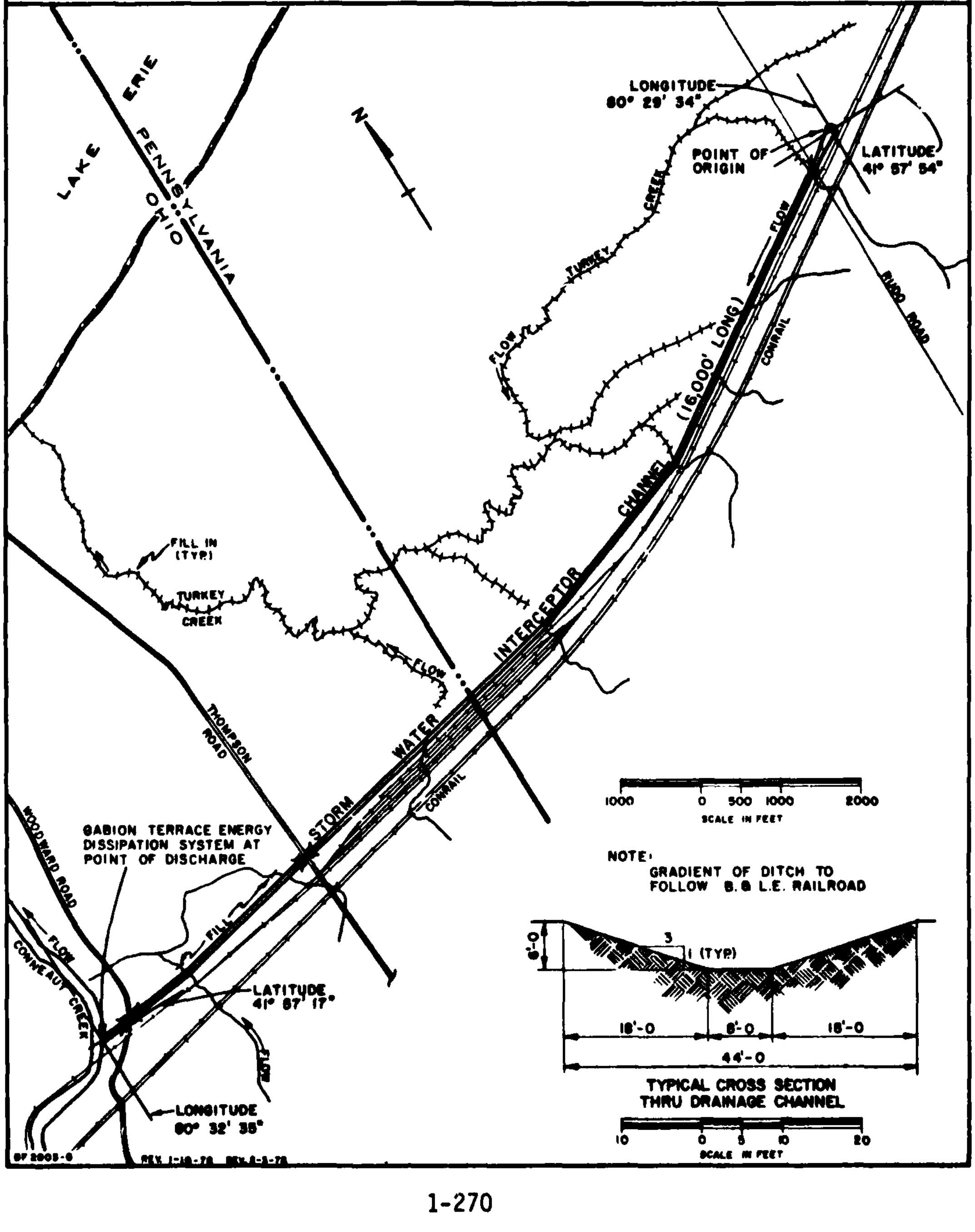
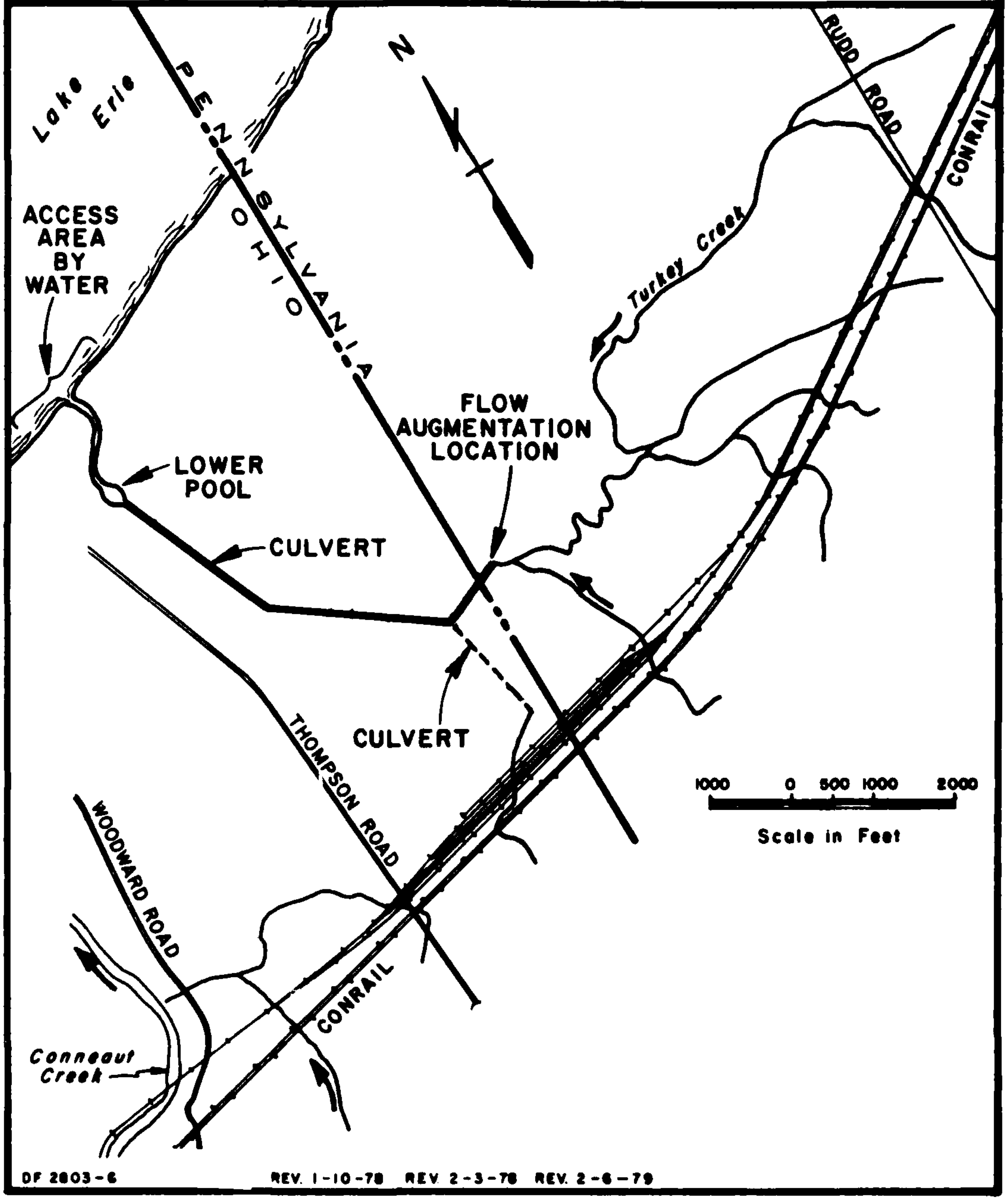


Figure 1-37 Proposed Culvert Location Plan



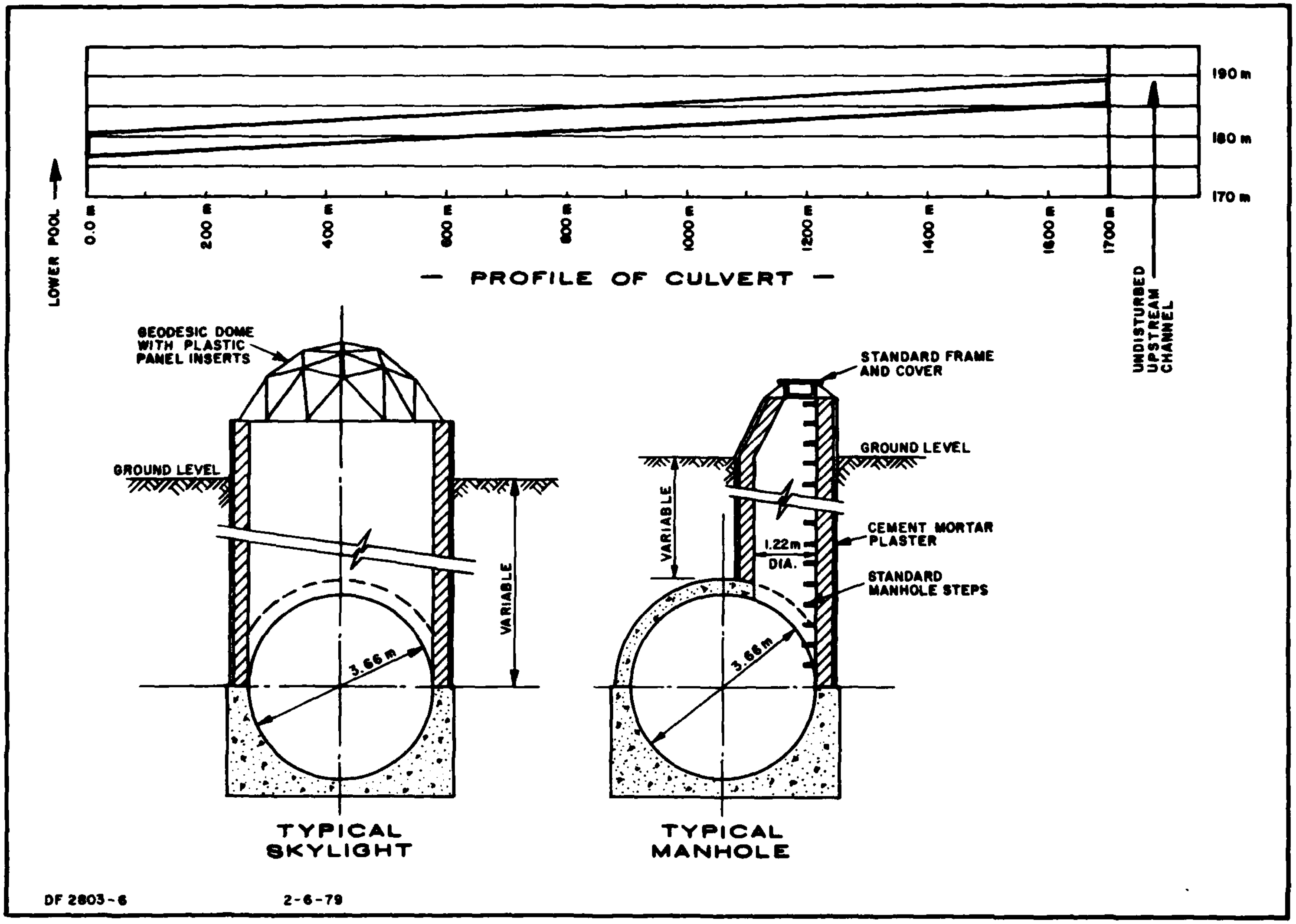
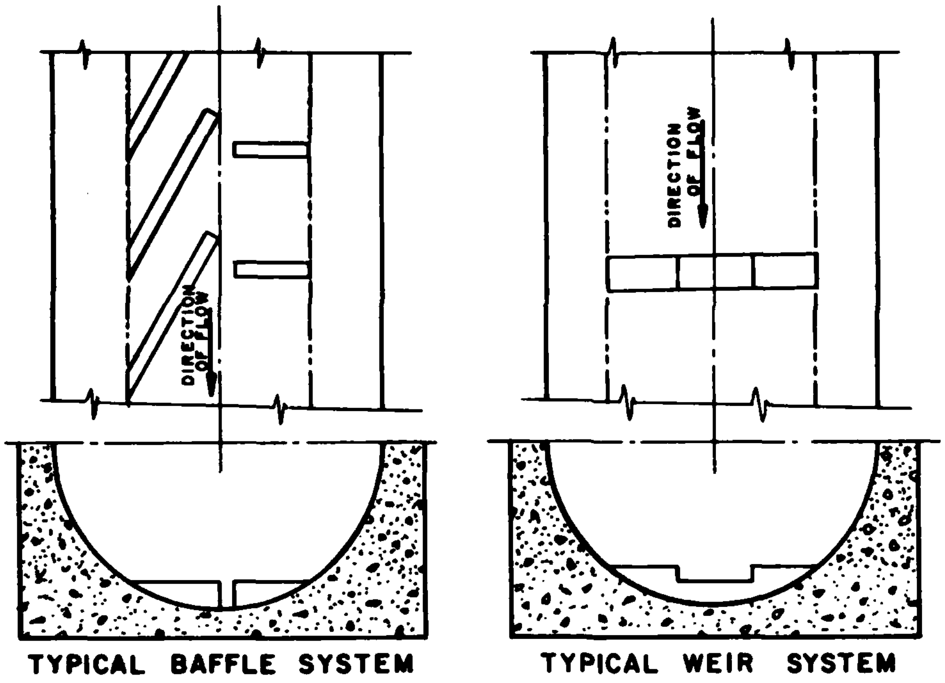


Figure 1-38(a) Proposed Culvert, Elevation and Sections



DETAILED PLANNING AND
ENGINEERING TO BE
COORDINATED WITH
RESOURCE AGENCIES.

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Figure 1-38(b) Fish Passage Options for Proposed Culvert

temperatures, thereby enhancing the suitability of the lower portion of Turkey Creek as salmonid habitat.

1.365
Between the downstream end of the proposed culvert and Lake Erie, the applicant intends to maintain Turkey Creek in its natural state. Under the direction of Ohio Department of Natural Resources, stream habitat improvements will be made to increase the potential for successful spawning by rainbow trout. At the present time, such plans include the creation and maintenance of permanent pools and gravel beds. In conjunction with this program of habitat improvement, the applicant has also agreed to allow fishermen access by boat to the mouth of Turkey Creek and the adjoining beach area.

1.366
The upstream portion of Turkey Creek between State Line Road and the southern boundary of the Lakefront Plant site will be left in its natural state. Although the applicant does not intend to manage or otherwise improve the aquatic habitat in this reach, the creek and its tributaries will be available to the Pennsylvania Fish Commission for such purposes.

DESCRIPTION OF CONSTRUCTION PROCEDURES AND CONSTRUCTION SUPPORT FACILITIES

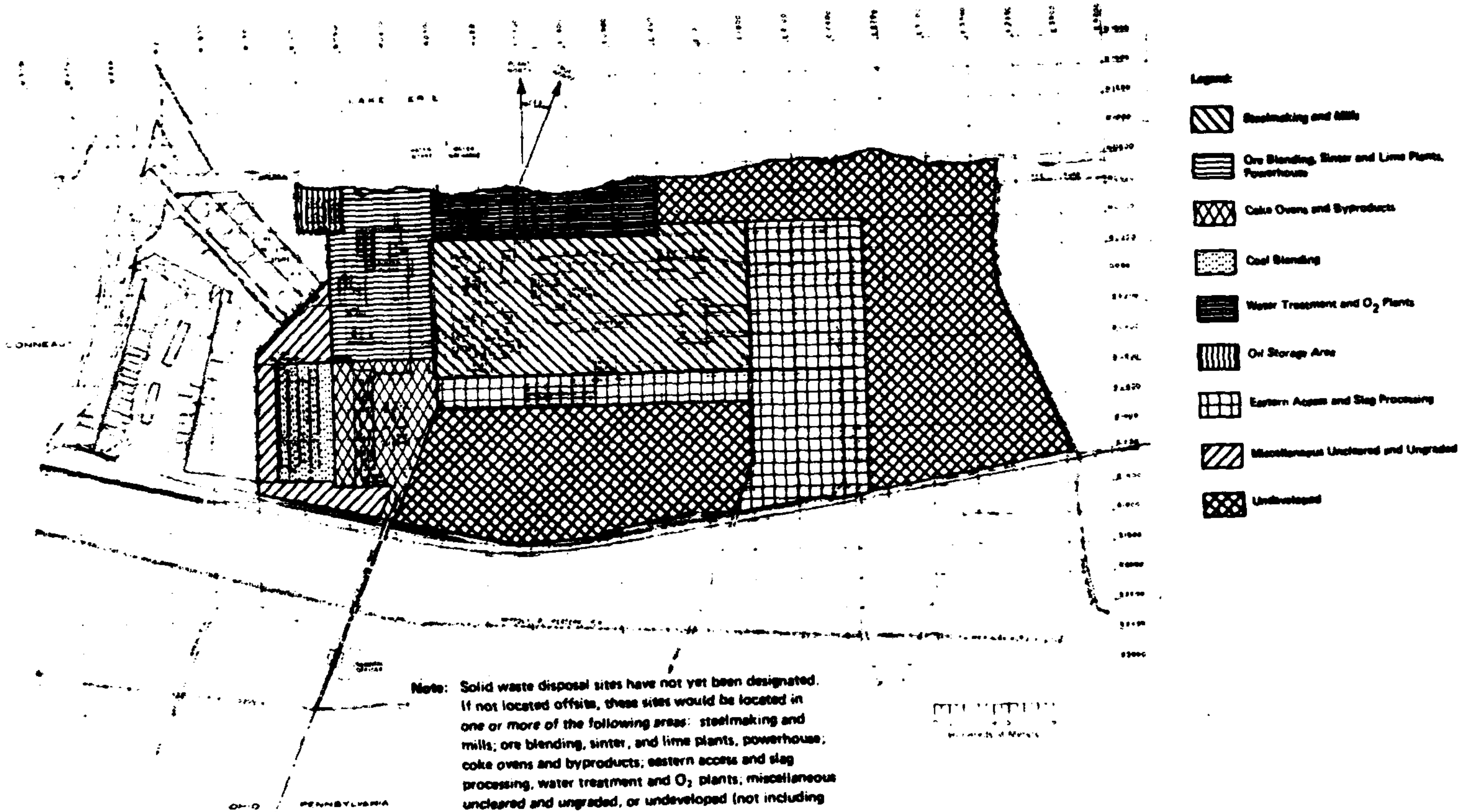
1.367
Construction and operation schedules presented in this final Environmental Impact Statement are based on the assumption that site preparation work would begin during the first quarter of 1979. The reviewer is cautioned that this is a hypothetical date which has been established solely for the purpose of predicting plant-related impacts over the short- and long-term. In actuality, construction of the Lakefront steel plant will not commence until such time as all of the necessary Federal, State, and local regulatory permits have been secured and the applicant has determined that sufficient capital is available to proceed with this action.

1.368
Construction of the Lakefront Plant will take place in two steps with each having a duration of three and a half years. Assuming the appropriate licenses and permits are secured from the various regulatory agencies involved in this proposal, Step I will begin in 1979, Step II in 1984. The applicant will contract for all the construction work and would maintain its own staff of onsite engineers to coordinate and inspect the work. Construction would proceed simultaneously on many different facilities associated with the plant. The pier extension on the Pittsburgh and Conneaut Dock

Company land, the offshore water intake and discharge pipelines, and the installation of shore protection will all proceed concurrently with construction of the various facilities within the plant. The maximum number of construction personnel would be employed about two and a half years after the start of Step I construction, when the construction of buildings would have progressed sufficiently to allow plant machinery to be installed. During the peak quarter, in excess of approximately 10,500 workers representing laborers, operating engineers, electricians, carpenters, iron workers, pipefitters, boilermakers, bricklayers, millwrights, teamsters, insulators, plumbers, sheet metal workers, administrative personnel, and engineers would be onsite daily. A similar peak of 6,500 workers would occur about two and a half years into Step II construction. The applicant will supply substantial amounts of the materials necessary for plant construction. Specifically, it is anticipated that virutally all structural and reinforcing steeland cement would be provided by U.S. Steel or its subsidiaries. Designated areas of the plant site will be set aside to receive shipments and store construction material and components not used in a reasonable amount of time. Although the U.S. Steel Corporation will supply portions of the materials and supplies necessary for construction of the plant, individual Contractors will be responsible for providing men, construction equipment, and supplies required to construct the plant. The applicant's onsite personnel will coordinate the Contractor's efforts and inspect the construction methods and the finished work.

1.369

The use of surface area of the potential land within the plant area must be known to estimate runoff characteristics (both during construction and operation). For the purpose of this discussion the term "plant area" refers to the 2,760 acres of land bounded on the north by Lake Erie, the east by Elmwood Road, the south by the Conrail tracks, and the west by an arbitrarily-located fence line connecting the railroad and the lake, as shown in Figure 1-31. Within the plant area, some 1,290 acres will be cleared and graded during construction. Completion of the plant would result in placement of approximately 550 acres of impervious surfaces (roads, buildings, developed areas, etc.) and ponds within the cleared and graded area, leaving an area of 740 acres which would be surfaced with slag or grass (440 acres) or just grass (300 acres). The remaining 1,470 acres of the plant area would not be cleared or graded. (1-8, 12, 13, 14). The plant area can be broken down into subareas within which the ultimate land uses are expected to be similar. Figure 1-39 delineates the various subareas, and Table 1-43 presents a breakdown of areas by functional category showing the distribution of land uses within each area. Solid waste land uses are not shown in Table 1-43 or Figure 1-39, since specific sites



Note: Solid waste disposal sites have not yet been designated. If not located offsite, these sites would be located in one or more of the following areas: steelmaking and mills; ore blending, sinter, and lime plants, powerhouse; coke ovens and byproducts; eastern access and slag processing, water treatment and O_2 plants; miscellaneous uncleared and ungraded, or undeveloped (not including Turkey Creek "greenbelt" area).

Source: Arthur D. Little, Inc.

FIGURE 1-30 PLANT AREA LAND USE DISTRIBUTION

have not been proposed. According to the applicant, waste disposal facilities would be located on-site within areas designated as slag/grass, uncleared/ungraded, or undeveloped in decreasing order of preference.

Construction Procedures

1.370

Prior to initiation of major construction activities, a fence will be placed around the site to control access to the site. The fence would prevent unauthorized access which could result in harm to construction equipment and/or the trespasser himself. Site preparation work would progress concurrently.

Site Preparation

1.371

Site preparation will consist of clearing, grubbing, and removal of all vegetation from areas to be developed during construction of Step I and Step II facilities. Clearing would be followed by grading (cutting and filling) to the desired plant elevation. Some 1,290 acres would be treated in this manner. The clearing and grading operations would proceed concurrently, commencing in the vicinity of the blast furnaces and steelmaking shop (the central portion of the project site). Clearing and grading will then progress in both directions to the edges of the areas requiring preparation. Within the first six months after the initiation of site preparation work, most of the clearing and grading will be completed. If the work is started during the month of March, very little site preparation would remain to be completed after nine months. The last three months of the preparation phase would be devoted primarily to cleanup activities. Once the site preparation work is completed, construction activities will focus on various specific locations within the site (e.g., blast furnace, steelmaking, etc.). After construction is completed, open areas will be seeded, or protected with a layer of slag. During the operating life of the plant, several hundred additional acres will be cleared and converted to solid waste disposal areas by grading, constructing dikes, and lining the area with impervious material as required.

a) Removal and Disposal of Vegetation

1.372

Current plans call for all brush, trees, and roots to be mascerated in a wood chipper, and sold as mulch to area nurseries. Under this plan, the applicant estimates that some 700,000-800,000 tons of chips will be produced during site preparation. This material will be stored temporarily on site until trucked to market. In this case, burning or use of vegetion as landfill will not be required.

The applicant has questioned the practicability of this plan, because the variety and distribution of vegetation on site is not ideal for removal and chipping, and market demand may not be large enough to absorb the tonnage generated. As an alternative, the applicant is considering a plan which involved the removal and sale of marketable timber and disposal of remaining vegetation through open pit incineration.

b) Handling of Top Soil

1.373
At the same time that vegetaion is being removed, loam top soil will be scraped off the surface of the land with graders, dozers, or other types of earth-moving equipment. Top soil will be collected and hauled by trucks to one or more storage areas on the site where it will remain until plant construction is complete. At that time, loam will be distributed and seeded on those portions of the cleared site where facilities have not been erected and that would not be heavily used during subsequent plant operations. As currently conceived, the applicant estimates that the redistribution and seeding operations will take place sometime after 1981 assuming the proposed plant is constructed.

Filling and Grading

1.374
Filling and grading will be accomplished using graders, dozers, scrapers, front-end loaders, and dump trucks. The exact method to be employed will depend upon the final plant design and layout. The proposed project area can be characterized as relatively flat land except for those areas adjacent to the several Lake Erie tributaries which traverse the site. The relatively low relief of the area indicates that although the graded area and amount of material moved will be extensive (1,290 acres, 5.56 million cubic yards), minimal changes in overall elevation will be required, and fill for the low areas (tributary drainages) will be obtained on site. The applicant does not anticipate that any offsite sources will be used for filling and grading material. The first step in the site development process will involve the culverting of Turkey Creek and the filling of intermittent tributaries to Lake Erie. Other valleys and gullies on the site will also be filled as required to achieve plant grade (elevation). In some cases, the applicant will convert valley areas into temporary settling ponds to collect surface runoff or groundwater pumped from excavations. If these sites do not provide sufficient capaccty, the applicant plans to construct additional settling ponds to insure the surface runoff is controlled.

Foundations

1.375
Foundations will be required for all major structures at the proposed plant. The preliminary results at onsite geotechnical studies show that the bearing capacity of the soils is uniformly good. This indicates that in most areas, few piles will be needed to support plant structures. Generally, the procedures followed for foundations not requiring piles is as follows: site preparation and leveling, foundation excavation, form building and placement of reinforcing bars, and pouring and curing of concrete. In areas where the land will have been filled extensively to bring the elevation up to grade, it might be necessary to drive piles through the fill into competent soils in order to achieve required load bearing capacities. The piledriving would be accomplished after foundation excavation and prior to form building. One very preliminary estimate based on past experience indicates that on the order of some 5,000 bearing piles and some 700,000 cubic yards of concrete might be required for foundation work. (1-12) Since the soils throughout the plant site are relatively impervious, complex or unusual dewatering operations are not anticipated, and seepage into foundation excavations is expected tobe minimal. Any water entering the excavations (e.g., rainwater) would be removed by pumps to the nearest settling basin where it would be retained for clarification prior to discharge into the lake, Conneaut Creek, or Turkey Creek Excavation for foundations will begin on major facilities (e.g., blast furnaces, hot strip mill, coke ovens) as soon as site preparation has proceeded to a point where unrestricted use of excavation equipment is possible.

Sources of Concrete

1.376
Concrete would be used in foundations and floors of all buildings in the plant and as a surface cap for the proposed pier installation in Conneaut Harbor. Although the exact amount required cannot be calculated until detailed design has been completed, the applicant estimates that some 700,000 cubic yards would be used. The concrete would be mixed by two onsite 200 cubic yard per hour batch plants using cement and aggregate brought to the site and stored nearby. Mixed concrete would be hauled to the placement sites by mixer trucks.

Delivery of Construction Materials

1.377
Construction materials will arrive onsite by rail, barge, and truck and be directed to specific storage areas. The storage areas

will be located where they would not interfere with construction and where there will be ready access to transportation. Construction aggregate is expected to arrive by barge from sources in the Regional Study Area such as, Cleveland, OH, Sandusky, OH, or the upper Great Lakes (quarries in Michigan). On arrival at the P&C Dock Company dock, the aggregate would be offloaded and transported by a presently existing conveyor to a reserved section of the existing iron ore storage area. Cement may arrive on site by rail, barge, or truck. From its point of arrival, it would be transferred to weather-protected storage silos located in the vicinity of the batch plants (which would be located near the storage area for construction aggregate). Aggregate and cement would be combined in the batch plant and would be hauled by concrete mixer trucks to the various construction sites. Structural steel, reinforcing bars, and plant equipment and machinery are expected to arrive by rail or truck at a designated staging area. Some heavy mechanical components may be shipped by barge. This material will be arranged in or transported into a "shake-out area," where a crane or other mobile equipment (e.g., straddle truck) can pick it up and move it out to the individual construction sites in an orderly fashion. The duration of the storage period for any particular piece of construction material will vary depending on such factors as delivery time, construction progress, and so on. In general, orders will be placed by the applicant to have material arrive sooner than, but as close as practically possible to, the date when it would be used in construction.

Plant Construction

1.378
Work will be proceeding concurrently on 12 major individual facilities within the site: dock facilities, raw material handling, two coke oven batteries and associated by-products plants, a sinter plant, a blast furnace, a steelmaking facility, a burnt lime plant, an oxygen plant, a continuous casting plant, a hot strip mill, and a hot-rolled finishing mill. In addition, work on utilities, roads, railroads, administration buildings, and general service facilities will also be underway. All work would be phased in such a way that various plant components of the Step I construction phase could be brought into operation in an orderly sequence by mid-1982. After the foundation for a facility has been constructed, structural steel will be erected, then siding and roofs will be put in place providing a sheltered work area for installation of plumbing, wiring, plant machinery and controls. At this stage, the construction will become a year-round operation, protected from adverse weather. This general phasing will be followed for all facilities, but differences will occur between facilities

due to the nature of the construction. For example, the blast furnaces and hot strip mill will be different because the blast furnace will not be totally enclosed in a building per se, whereas the strip mill will. Steel work and brick work on the blast furnace will proceed together whereas the building for the hot strip mill would be erected and then the various rolling mills would be installed, piped, and wired.

Construction Logistics

Schedule

1.379

Construction and operation schedules presented in this final Environmental Impact Statement are based on the assumption that site preparation work would begin during the first quarter of 1979. The reviewer is cautioned that this is a hypothetical date which has been established solely for the purpose of predicting plant-related impacts over the short- and long-term. In actuality, construction of the Lakefront steel plant will not commence until such time as all of the necessary Federal, State, and local regulatory permits have been secured and the applicant has determined that sufficient capital is available to proceed with this action.

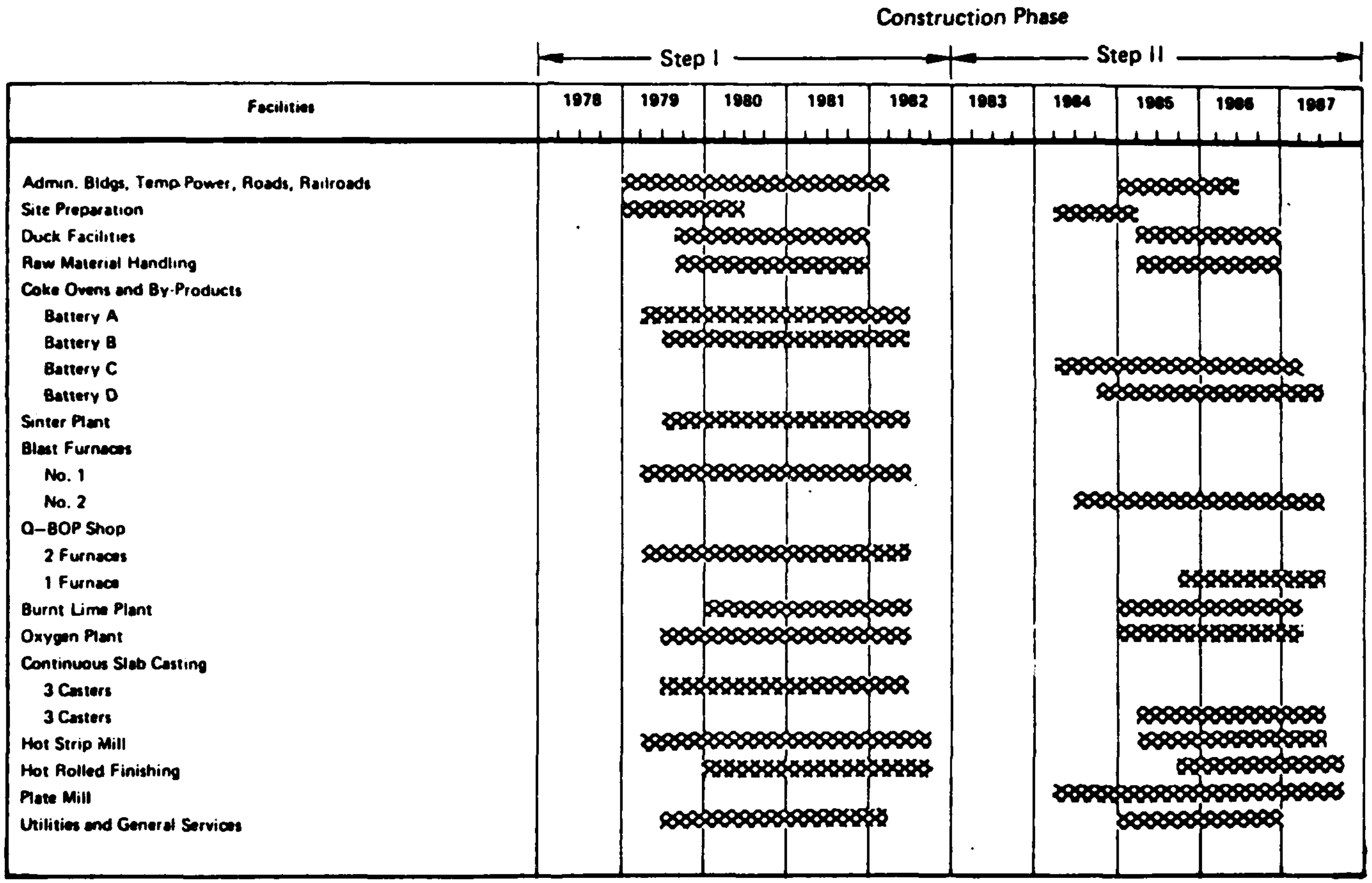
1.380

The applicant's anticipated schedule for construction of plant process units and support facilities is presented in Figure 1-40. General procedure calls for completion of the raw materials handling facilities first, followed by construction of process units which will support the steelmaking operation (these include the coke ovens, sinter plant, burnt lime plant, and oxygen plant). Plant facilities completed last include the blast furnaces, Q-BOP, continuous casters, and other mills.

Personnel

1.381

The estimated construction manpower requirements per quarter for each facility within the proposed Lakefront Plant is presented in Table 1-44. Distribution of manpower by skill requirement during the Step I and Step II construction phases are shown in Table 1-45. During the peak construction period of Step I (2nd quarter, 1981), 10,500 people would be working on the site while in Step II, peak requirements are expected to be lower, totalling 6,600 during the first quarter of 1986. The period of about a year and a half between Steps I and II is planned to allow for time schedule adjustments in Step I, start up of portions of the mill built during Step I, and any changes in construction procedures for Step II as indicated by the experience gained during Step I.



Source: United States Steel Corporation.

Figure 1-40 Proposed Lakefront Plant Construction Schedule

AD-A079 396　CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT　F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY UNIT--ETC(U)
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Table 1-44

Estimated Manpower by Facility for the Proposed Lakefront Plant-Steps I and II

Facilities	1978				1979				1980				1981				1982				1983				1984				1985				1986				1987			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Admin. Bldg., Temp Power, Roads, Railroads					50	200	200	200	200	200	200	200	200	200	200	100	50												50	100	100	200	200	50						
Site Preparation					130	225	250	250	100	50																100	100	100	50											
Dock Facilities							50	150	200	300	300	300	300	300	200	100														30	100	170	100	150	50	50				
Raw Material Handling							50	150	200	300	300	300	300	300	200	100														50	120	200	200	120	50	50				
Coke Ovens and Byproducts																																								
Battery A						75	100	200	400	600	800	1100	1200	1100	800	400	100																							
Battery B							50	100	200	400	600	800	1100	1200	1100	800	400	100																						
Battery C																										30	50	100	400	600	800	1100	1200	1100	800	400	100			
Battery D																												40	100	400	600	800	1100	1200	1100	800	400	100		
Sinter Plant							50	100	200	300	400	400	400	500	400	300	200	50																						
Blast Furnaces																																								
No. 1						75	200	300	300	500	700	750	800	800	800	700	500	100																						
No. 2																											20	170	300	500	700	750	800	800	800	700	400	100		
Q-BOP Shop																																								
2 Furnaces						75	200	300	400	500	600	700	700	700	600	500	400	100																						
1 Furnace																																100	200	200	200	100	50	10		
Burnt Lime Plant									75	200	200	300	200	300	300	200	100	50											30	100	100	200	200	200	150	150	50			
Oxygen Plant							30	50	80	200	200	300	300	300	200	200	150	50											50	100	170	200	100	170	150	150	50			
Continuous Slab Casting																																								
3 Casters							50	100	200	400	400	500	600	600	600	600	400	100																						
3 Casters																														100	120	220	230	250	200	170	50	20		
Hot Strip Mill						200	400	600	600	800	800	1150	1320	1000	700	500	600	375	50											50	100	250	250	250	200	150	50	75		
Hot Rolled Finishing									70	200	300	500	600	750	700	600	500	400	170													100	110	150	150	120	50	50	50	
Pipe Mill																										40	50	70	220	370	500	800	800	900	900	1000	400	150	70	
Utilities and General Services							50	100	300	500	700	800	800	800	750	600	200												50	200	400	400	400	300	200	100				
Misc. - U.S.S. Engrg, Plant Protec., Fire, Survey, Stores, Clerks					50	150	200	300	375	400	400	500	500	600	600	500	400	200	100							50	100	150	200	400	400	400	500	500	500	400	200	100	30	
Total Manpower At Site					230	[illegible]	[illegible]	[illegible]	4100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1525	320							220	320	630	1450	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	150	

Source: United States Steel Corporation

Table 1-45

Estimated Manpower by Skill Category for the P-oposed Lakefront Plant - Steps I and II

	[illegible]				[illegible]				[illegible]				[illegible]				[illegible]				[illegible]				[illegible]				[illegible]				[illegible]			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Laborers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Carpenters		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]											[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
Ironworkers		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]											[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Bricklayers				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-												[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Operating Engrs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	175	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Boilermakers					15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-												[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Electricians	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Pipefitters		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]									[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Millwrights				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Misc. Teamsters, Insulators, Etc	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
U S S & Misc. Personnel For Subcontract Items Etc	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Source: United States Steel Corporation

Equipment

1.382
Construction equipment will be provided by the individual Contractors. The applicant estimates that 50 or more pieces of earthmoving equipment may be operating continuously on any given day during site preparation. Also, during construction, as many as 900 heavy-duty truck vehicle miles per day and 9,500 light-duty truck vehicle miles per day could be traveled on the site. The peak construction equipment requirements during the Step I phase of construction have been estimated by the applicant utilizing past experience. These data are presented in Table 1-46. Peak requirements for each equipment type will generally occur at different times. For example, scrapers and dozers would peak during site preparation while welding machine use would peak during the steel erection phase.

Construction Pollution Control Plans

1.383
At this time, although no specific plans have been developed by the applicant to control pollution during the construction phase, the applicant is cognizant of the need for pollution control during this phase of the project and is currently developing detailed plans to achieve such control.

Dust Control

1.384
During extended periods of dry weather, fugitive dust will be a problem, particularly in areas where site preparation is underway or heavy construction traffic is encountered. Particularly dusty areas will be periodically sprayed with water by trucks designed for that purpose.

Erosion and Sedimentation Control

1.385
An erosion control plan conforming to the requirements of the Commonwealth of Pennsylvania (Ohio has no such requirements) will be developed for the entire site prior to the commencement of construction. Since all streams in the site area empty into Lake Erie, the methods used in handling construction in or near these water courses will have a significant influence on the amount of soil disturbed and transported to Lake Erie. To date, plans are developed only to install one or more settling basin in areas where sediment-laden surface runoff can be detained and clarified prior to its discharge. To date, the applicant has not specified the location of such basin(s) or the method that will be used to treat surface water runoff, since these activities are subject to regulation by other Government agencies.

Table 1-46

Peak Equipment Requirements During Construction--Step I

Crane (30 Ton and Above)	90
Backhoe (3/4 - 2-1/2)	55
Dragline	4
Scraper	40
Dozers	25
Hydraulic Cranes (15-20 Ton Cherry Picker)	100
Low Boy (60-100 Ton)	10
Straddle Trucks	12
1/2 Ton Pickup	130
Truck Tractor	60
Tank Trucks (Fuel)	10
Stake Truck (2-1/2 Ton)	110
Front End Loader (2-1/2 Cu Yd Front-End Loader Rubber Tire)	13
Compressor (600-900 Electric)	12
Compressor (600-Diesel)	70
Graders	10
Dump Trucks	80
Concrete Mixer Trucks	60
Concrete Batch Plants at 200 Cu Yd Per Work Day	2
Maintenance Trucks	5
Line Trucks (Electric)	30
Diesel Generator	4
A-Frame Winch Truck	20
Hydraulic Tail Gate Lift	15
Grove Main Lift Trucks	20
Electric-Weld Machines	400
Diesel Driven Welding Machines	215
Tower Derrick	4
30-Ton Kangaroo	6
Pile Drivers	18

Source: United States Steel Corporation.

Noise Control

1.386
The equipment operating on the site will be subject to any noise control measures currently required by regulations or law.

Solid Waste Disposal

1.387
Permanent disposal sites for solid wastes will not be available during the construction phase. Scrap iron or steel generated during construction will be collected and stored in a temporary scrap yard and sold as accumulated. Combustibles which are not marketed would probably be incinerated by open pit, assuming the necessary permits are secured.

Offsite Construction

1.388
The only offshore construction directly related to the proposed plant involves the establishment of access roads. Once the right-of-way is selected, the land will be cleared of vegetation and graded and filled as required. Right-of-way preparation would be followed by any necessary foundation work (bridge and overpass abutments), placement of structures, road surfacing and placement of any utilities (lights, stormwater sewers). The exact alignment of the access roads will not be known until final design is undertaken. However, it is probable that there would be three roads entering the plant. One, starting at Route 20 and following the original alignment of State Line Road, will enter the western end of the proposed plant near the coke ovens. A second will branch from Rudd Road to enter the eastern portion of the proposed plant site. The third would be a new road alignment connecting the West Springfield interchange on I-90 to the eastern end of the plant.

1.389
The access roads will probably cross all railroad corridors on overpasses to permit uninterrupted flow of traffic and it is likely that the span of one or more of these overpasses will be long enough to require the construction of trusswork bridges. The western access road will have to cross the nine-track coal car storage yard, the new spur to the proposed steel plant, and the existing two-track Conrail line in one span, which will likely require construction of a trusswork bridge. A second crossing will have to span the existing Norfolk and Western track (two tracks) about 0.3 miles to the south. The middle access road will follow Rudd Road north from Route 20 across the Norfolk and Western track, (two tracks) and across the Conrail and plant spur tracks (four

tracks). Two overpasses will have to be constructed. The access road will swing west, leaving the Rudd Road alignment just north of the second overpass. The eastern access road will follow an entirely new alignment which would cross the Conrail track (two tracks), the Norfolk and Western track (two tracks), and State Route 5 on overpasses, and will connect with Highway 6N at Route 20, only a short distance from the West Springfield Interchange on I-90. The distance between Route 20 and the Conrail tracks along this alignment is approximately one and one-half miles.

1.390
No detailed estimate has been made concerning manpower or equipment requirements or the availability of State and Federal funds to construct these offsite thoroughfares. However, for the purposes of this impact analysis, it has been estimated that highway and street construction activities would peak during the first and third years of construction (35 percent in 1979, 50 percent in 1981) for Step I construction. Therefore, all access roads in use be completed or usable by mid-1981 when peak construction employment occurs on site.

FEDERAL STATE AND LOCAL INTERAGENCY COORDINATION

1.391
Due to the magnitude of the proposed action and the number and complexity of the regulatory requirements to be met, an intergovernmental technical team was established by the Corps of Engineers in March 1977. The team was organized to facilitate interagency coordination as well as coordination with the applicant and the applicant's consultant for this project. Besides maintaining coordination, the team identified and defined all Federal, State, and local requirements which must be met by the applicant; reviewed proposals for the collection of field data and participated in on-site sampling surveys; identified critical areas where the environmental impact of the proposed action was judged to have the greatest effect; and recommended courses of action which would tend to offset or mitigate environmental impact. The team activities were directed by the agency administrators or their designated representatives who also provided guidance relative to policy matters and the setting of environ-mental standards and guidelines. Direct day-to-day contact and coordination with the applicant and the consultant was established and maintained by the agency staff representatives appointed to the technical team. A list of the representatives currently serving on the Interagency Technical Team is presented in Table 1-47.

Table 1-47

Interagency Technical Team Proposed Lakefront Steel Plant

ADMINISTRATIVE REPRESENTATIVES

Colonel Daniel D. Ludwig (Team Chairman)
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

Mr. Stephen P. Curtis
Assistant to the Executive Vice President
Engineering and Research
U.S. Steel Corporation
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Pittsburgh, PA 15230

John McGuire, Administrator
U.S. Environmental Protection Agency
Region V
230 Dearborn Street
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John Kane, Staff Director
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Mr. Jack J. Schramm
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Charles A. Hughlett, Acting Regional Director
U.S. Fish and Wildlife Service
Federal Building and Fort Snelling
Twin Cities, MN 55111

Howard Larson, Regional Director
U.S. Fish and Wildlife Service
One Gateway Center
Newton Corner, MA 02158

Table 1-47 (Cont'd)

ADMINISTRATIVE REPRESENTATIVES (Cont'd)

Honorable James A. Rhodes
Governor, State of Ohio
Columbus, OH 43215

Honorable Richard Thornburgh
Governor, Commonwealth of Pennsylvania
Harrisburg, PA 17120

TECHNICAL REPRESENTATIVES

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Surveillance and Analysis Division
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Table 1-47 (Cont'd)

TECHNICAL REPRESENTATIVES (Cont'd)

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James McAvoy, Director
Ohio EPA
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Mr. Wesley Gilbertson
Special Assistant for Planning
Pennsylvania Department of Environmental Resources
Room 818, Executive House
Harrisburg, PA 17120

Dr. Robert Lippson
Environmental Assessment Branch
National Marine Fisheries Service
Oxford Laboratory
Oxford, MD 21654

REGULATORY REQUIREMENTS WHICH MUST BE SATISFIED IN ORDER TO CONSTRUCT AND OPERATE THE PROPOSED PLANT

Summary of Present Requirements

1.392
The proposed project must comply with a variety of environmental requirements mandated by Federal, State, and local laws and regulations. Most of these requirements are at the Federal and State levels and extend to the areas of air, water, solid and hazardous waste, land use, noise, toxic materials, and threatened and endangered species. The environmental laws and regulations with which the project must comply are listed in Table 1-48 and are discussed in the following sections.

Air Pollution Regulations

The Clean Air Act

1.393
The Clean Air Act of 1970 (PL 91-604) establishes a comprehensive statutory framework for control of air pollution. The Act sets National Ambient Air Quality Standards (NAAQS) for pollutants which have "adverse effects upon public health and welfare" and provides authority for regulatory actions to achieve and maintain the standards throughout the nation. Major provisions of the Act with particular relevance to the proposed project are those which require establishment of:

- "criteria" pollutants,
- National Ambient Air Quality Standards (NAAQS),
- Air Quality Control Regions (AQCR),
- New Source Performance Standards (NSPS),
- State Implementation Plans (SIP), and
- National Emission Standards for Hazardous Air Pollutants (NESHAP).

Subsequent to enactment, EPA regulations have been promulgated to implement these provisions; a discussion of these provisions and regulations follows.

1.394
In addition, substantive Amendments to the Act were enacted in August 1977. The Amendments substantively change several provisions of the Act and regulations. Changes relevant to the proposed project include those which require:

- Periodic Review of the NAAQS,
- Evaluation of several pollutants for listing as hazardous pollutants,

- Revisions in SIP,
- Changes in the regulations addressed to prevention of significant deterioration (PSD), and
- Inclusion in the provisions of the Act of Policy pertaining to new source growth in non-attainment areas.

Table 1-48

Environmental Laws and Regulations Revelant to the Proposed Lakefront Steel Plant

Laws/Regulations	Administering Agency
National Environmental Policy Act	U.S. Army Corps of Engineers (Administrative Lead Agency)
Air	
Clean Air Act (and 1977 Amendments) (PL 91-604)	United States Environmental Protection Agency (USEPA)
Ohio: Particulate Matter and Sulfur Oxides Standards (OAC 3745-17)	Ohio Environmental Protection Agency (OEPA)
Ohio: Carbon Monoxide, Photochemically Reactive Materials, Hydrocarbons and Related Materials (OAC 3745-21)	OEPA
Ohio: Permits to Install New Sources of Pollution (OAC 3745-31)	OEPA
Ohio: Air Permits to Operate and Variances (OAC 3745-35)	OEPA
Ohio: Open Burning Standards (OAC 3745-19)	OEPA
PA: Air Pollution Control Act (PL 2119)	Pennsylvania Department of Environmental Resources (PA DER)
PA: Construction, Modification, Reactivation, and Operation of Sources (Title 25, Chapter 127)	PA DER
PA: Ambient Air Quality Standards (Title 25, Chapter 131)	PA DER
PA: National Emission Standards for Hazardous Air Pollutants (Title 25, Chapter 124)	PA DER

Table 1-48 (Cont'd)

Laws/Regulations	Administering Agency
PA: Standards for Contaminants (Title 25, Chapter 123)	PA DER
PA: Standards for Sources (Title 25, Chapter 129)	PA DER
Water	
Clean Water Act (33 U.S.C. 1251 e.t. seg.)	United States Environmental Protection Agency (USEPA) Except Section 404 which is administered by the Corps of Engineers
Safe Drinking Water Act (PL 92-523)	USEPA
Section 10 of Rivers and Harbors Act of 1899 (33 U.S.C. 401-413)	U.S. Army Corps of Engineers (USCOE)
Ports and Waterways Safety Act of 1972 (PL 92-340)	United States Coast Guard (USCG)
Ohio: EPA Regulations Water Quality Standards (OAC 3745-1)	Ohio Environmental Protection Agency (OEPA)
Ohio: EPA Regulations: Permits to Install Sources of Pollution (OAC 3745-31)	OEPA
Ohio: NPDES Permit Regulations (OAC 3745-33)	OEPA
Ohio: Miscellaneous Water Supply Regulations (OAC 3745-6)	OEPA
PA: Clean Streams Law (PL 1987)	Pennsylvania Department of Environmental Resources (PA DER)
PA: Erosion Control Rules and Regulations (Title 25, Chapter 102)	PA DER
PA: Water Obstructions Act (PL 555, Section 4)	PA DER

Table 1-48 (Cont'd)

Laws/Regulations	Administering Agency
Solid and Hazardous Waste	
Federal Resource Conservation and Recovery Act (PL 94-580)	USEPA
PA: Solid Waste Management Act (Act 241)	PA DER
PA: Solid Waste Management Rules and Regulations (Title 25, Chapter 75)	PA DER
PA: Erie County Regulation I - Disposal of Solid Wastes and Chemicals (Pursuant to PL 1304)	Erie County Board of Health
PA: Proposed Ordinance of Springfield Township - Sanitary Landfill Areas (Section 611)	Springfield Township
PA: Proposed Ordinance of Springfield Township - Performance Standards (Section 608)	Springfield Township
Land Use	
Coastal Zone Management Act of 1972 (PL 94-370)	National Oceanographic and Atmospheric Administration (NOAA) Ohio Department of National Resources (ODNR) Pennsylvania Department of Environmental Resources (DER)
Other	
Toxic Substances Control Act (PL 94-469)	United States Environmental Protection Agency (USEPA)
Endangered Species Act of 1973 (PL 93-205)	U.S. Department of Commerce and Interior

Table 1-48 (Cont'd)

Laws/Regulations	Administering Agency
Noise Control Act of 1972 (PL 92-574)	USEPA
Objects Affecting Navigable Air Space, Part 77 CFR	Federal Aviation Administration
State Owned Submerged Lands (Ohio Revised Code, Section 123.031)	Ohio Department of Administrative Services

These and other relevant provisions of the Amendments are included in the following discussion.

a) Criteria Pollutants

1.395
Section 108 of the Act requires a listing of pollutants which have "an adverse effect on public health and welfare" and which are present in the ambient air as a result of "numerous or diverse mobile or stationary sources." For each such pollutant, development of air quality criteria is required which includes the latest scientific knowledge regarding adverse effects and factors and conditions contributing to such effects. Early in 1971, six "criteria" pollutants were designated: sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide. Subsequent research and evaluation has resulted in the additions of toxic lead to the list in March 1976 and as such, promulgation of national primary and secondary standards for lead will occur in the future.

b) National Ambient Air Quality Standards

1.396
Section 109 of the Act requires that NAAQS be established following each designation of a "criteria" pollutant. Primary standards are to be set at a level deemed necessary to protect public health with an "adequate margin of safety." Secondary standards are to be set at a level deemed necessary to protect the public welfare, including effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate, economic values, personal comfort and well being, and damage to and deterioration of property. NAAQS are applicable to all areas of the nation except those States which have adopted more stringent standards. The 1977 Clean Air Act Amendments have added to this section the requirement that all the NAAQS be reviewed by 31 December 1980, at five-year or more frequent intervals thereafter, and revised as appropriate. Further, within one year of enactment of the Amendments, the Administrator is to evaluate and, if warranted, promulgate a primary NAAQS (for a three-hour period or less) for nitrogen dioxide (NO_2). In addition, as discussed in the section entitled National Emission Standards for Hazardous Air Pollutants, the Amendments require that cadmium, arsenic, polycyclic organic matter (POM) and radioactive pollutants be evaluated to determine whether they should be listed as criteria or hazardous pollutants.

c) Air Quality Control Regions

1.397
In Section 107 of the Act, AQCR's are designated throughout the nation as geographic units within which NAAQS must be achieved and maintained. Designated AQCR's may be comprised of any interstate or intrastate area deemed necessary or appropriate for attainment and maintenance of the standards. The proposed project is located in the Northwestern Pennsylvania -- Youngstown Interstate AQCR 67. Each State has the primary responsibility for assuring air quality maintenance within all AQCR's or portions thereof within its boundaries.

d) National Emission Standards for Hazardous Air Pollutants

1.398
Hazardous pollutants have been defined as those to which no ambient air quality standard is applicable and which may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness (Section 112). As with criteria pollutants, hazardous pollutants are first "listed"; subsequently, following development of supporting data, standards are promulgated. To date, standards have been promulgated for asbestos, beryllium, vinyl chloride, and mercury. The standards are applicable to only a few specified source categories, none of which are included in the proposed project. On 8 June 1977, the EPA added benzene to the list of hazardous air pollutants. Emission standards for benzene have not yet been promulgated. The listing following a petition from the Environmental Defense Fund and development of substantial data showing that benzene can cause, or contribute to, adverse health affects. In addition, coke ovens were identified as one of the principal sources emitting benzene to the ambient air. In a new section added to the Act under the 1977 Amendments entitled "Unregulated Pollutants," the Administrator is required to determine within one year of enactment whether cadmium, arsenic, and polycyclic organic matter, and within two years of enactment whether radioactive pollutants, cause or contribute to air pollution. If so, these pollutants shall be listed as hazardous or criteria pollutants and subsequently national standards (which could apply to the proposed project) shall be promulgated. Any such pollutants may also be included in performance standards for new sources. Also, the 1977 Amendments provide that hazardous emission standards may be issued as design standards rather than as allowable numerical values when it is not possible or feasible to measure hazardous emissions or to capture them through appropriate control devices. In these situations, the Administrator may instead "promulgate a design, equipment, work practice, or operational standard, or combination thereof, which in his judgment is adequate to protect the public health from such pollutant or pollutants with an ample margin of safety."

and non-attainment areas, and 2) exemption requirements for indirect source review for SIP's. A summary of the relevant provisions required for SIP's, including the modifications made in the Amendments of 1977 is presented below.

> Plans must assign a priority classification to each criteria pollutant within each AQCR for purposes of guiding the expenditure of effort and resources for plan development and implementation. The priority classification will indicate the relationship of the ambient level of each criteria pollutant to the NAAQS.
>
> For each AQCR in which the ambient level of a criteria pollutant exceeds the NAAQS, the plan must develop a control strategy which provides for the degree of emission reduction necessary for attainment and maintenance of the national standard. In determining the necessary emission reduction, consideration must be given to emission increases which can be reasonably expected to result from projected increases of population, vehicle traffic and industrial activity. The control strategy must consist of source-specific emission limitations and schedules necessary for achieving the standard.
>
> For each AQCR in which the ambient level of any criteria pollutant is below the secondary NAAQS, the plan must develop a control strategy to prevent ambient pollution levels from exceeding that standard.
>
> Plans must comply with all provisions of the 1977 Amendments which pertain to prevention of significant deterioration of air quality in any area where existing air quality is better than NAAQS. Plans must provide for an enforceable permit program which requires preconstruction review of all new and modified sources for purposes of preventing significant deterioration and for insuring no interference with an approved control strategy and with attainment and maintenance of NAAQS. (Refer to the subsection entitled "Prevention of Significant Deterioration," which appears later in this section).
>
> Plans must comply with all provisions of the 1977 Amendments which pertain to new source growth and modification in areas which exceed NAAQS. (See the subsection entitled "New Source Growth in Areas Exceeding NAAQS," which appears later in this section).

e) New Source Performance Standards (NSPS)

1.399
NSPS are to be developed for each category of new stationary sources which contributes significantly to air pollution and which may contribute to endangering the public health or welfare (Section 111). The standards must reflect the degree of emission limitation achievable through application of the Best Available Control Technology (BACT). In establishing NSPS, distinction may be made among classes, types, and sizes of sources within each category. The Act requires that source categories be identified within three months and final NSPS promulgated within ten months of enactment. The listing of source categories has been completed, and iron and steel manufacturing has been identified as a source category. However, development of NSPS has been completed for only some of the categories. Standards for others, including iron and steel manufacturing, are currently being developed. In lieu of these standards, the USEPA and the State of Ohio and Pennsylvania are defining the level of technology and the standards with which the proposed project must comply. In summary, for criteria pollutants, all emission sources of the proposed project, including stationary and volume or area sources, must meet emissions levels associated with BACT (for pollutants in compliance with NAAQS), the Lowest Achievable Emissions Rate (LAER) (for non-attainment areas), or State Implementation Plans (SIP) (when emission rates are required to be more stringent than BACT or LAER). Table 1-49 summarizes the control levels which will apply to the various criteria pollutants.

f) State Implementation Plans

1.400
Section 110 of the Act requires each State to adopt -- and the EPA to approve -- plans for the implementation, maintenance, and enforcement of the NAAQS. These plans, commonly called State Implementation Plans (SIP) are to provide a regulatory framework for achieving and maintaining NAAQS within each AQCR in the State. To receive EPA approval, any SIP has had to demonstrate the means to assure attainment of primary NAAQS within three years and attainment of secondary NAAQS within a reasonable time after plan approval -- for primary standards this could not be later than mid-1975. Under the 1977 Amendments, any approved SIP must demonstrate the capability to achieve and maintain NAAQS for all criteria pollutants except photochemical oxidants and carbon monoxide by 31 December 1982, and for these pollutants by 31 December 1987. Under the Act, plans were required to contain certain provisions addressed to attainment and maintenance of NAAQS. The 1977 Amendments modified these provisions only modestly by 1) requiring that enforceable permit programs be established for review of new and modified sources in both attainment

Table 1-49

Emissions Control Levels Applicable to Criteria Pollutants

Pollutant	Total Suspended Particulates	Sulfur Oxides (SO2)	Photochemical Oxidants/Hydrocarbons	Carbon Monoxide (CO)	Nitrogen Oxides (NOx)
Attainment Status	Yes (1)	Yes (2)	No	Yes	Yes
Most Stringent (3) Emission Control Level	BACT or SIP	BACT or SIP	LAER (and Emissions Offsets (4)	SIP	SIP

(1) Erie City and certain parts of Ashtabula County are presently non-attainment areas. Exacerbation of any NAAQS violations would result in a requirement for LAER and emission offsets.

(2) Certain parts of Ashtabula County are not non-attainment areas.

(3) Modeling results may dictate more stringent emission limitations than specified to ensure compliance with NAAQS and maximum allowable increments, as discussed later in subsection entitled "Prevention of Significant Deterioration,"

(4) Discussed later in this section in the subsection entitled "New Source Growth in Areas exceeding NAAQS.

Source: US EPA and Arthur D. Little, Inc.

Plans may at State discretion include, but are not required to include, indirect source review programs. Federally authorized indirect source review programs are limited to major Federally assisted, owned or operated indirect sources, such as highways and airports. Definitions necessary to interpret this provision are as follows:

> Indirect sources: A facility, building, structure, installation, real property, road or highway which attracts or may attract mobile sources of pollution.
>
> Indirect source review program: The facility-by-facility preconstruction of premodification review of indirect sources of air pollution, including such measures as are necessary to assure, or assist in assuring, that a new or modified indirect source will not attract mobile sources of air pollution, the emissions from which would cause or contribute to concentrations exceeding or preventing attainment and maintenance of NAAQS for a mobile source-related pollutant.

Plans must include procedures for source surveillance which provide for monitoring compliance of stationary sources with emission limitations, periodic source inspection and testing requirements for owners or operators to install and operate equipment for continuous monitoring and recording of emissions record keeping and reporting activities.

Plans must demonstrate that the State has adequate authority to carry out the plan, including authority to adopt emission standards and to enforce applicable laws and regulations.

g) New Source Growth in Areas Exceeding NAAQS

1.401
Under the Act, all SIP must contain regulations requiring preconstruction review of new sources and disapproval of sources which would interfere with the attainment or maintenance of a NAAQS. Since new sources frequently have sought to locate in such "non-attainment" areas, complex questions have arisen as to whether new source construction and resultant economic growth may legally be permitted or excluded from these areas. In December 1976, the EPA issued an interpretative ruling on this subject in order to provide States with a framework for such decisions. However, States were not required to use the ruling in new source reviews if applicable State or local requirements were more stringent. Rather, the ruling established

minimum requirements which must be met in order to remain in compliance with the Clean Air Act. The Amendments of 1977 addressed the issue of new source growth in non-attainment areas in considerable detail. In summary, the Amendments retained most of the provisions of the interpretative ruling, effective through 1 July 1979. After this date, new sources proposing to locate in non-attainment areas must comply with requirements set forth in a new section of the Act entitled "Plan Requirements for Non-Attainment Areas." Since the Amendments extend the dates for attainment of NAAQS to December 1982 for all pollutants except photochemical oxidants and hydrocarbons, and to 31 December 1987 for these pollutants, States must revise their SIP's accordingly, and in so doing, provide a framework for treating new source growth in non-attainment areas in accord with these requirements.

1.402
The interpretative ruling distinguishes between major sources and smaller sources and provides that a major new source may locate in a non-attainment area only if certain stringent conditions are met. The conditions are designed to ensure that emissions from the new source will be controlled to the greatest extent possible, that emission reductions more than equivalent to the new source emissions will occur at other existing sources, that existing sources will be in compliance, and that, overall, there will be progress toward attainment of the NAAQS.

1.403
A major source is defined as one for which the potential emission rate is equal to or greater than the following:

Tons per year	Pollutant
100	Particulate matter, sulfur oxides, nitrogen dioxide or nonmethane hydrocarbons
1,000	Carbon monoxide

Preconstruction review for major sources must consist of an air quality analysis (based on modeling procedures) to determine if violation of an NAAQS would occur or be exacerbated. In such cases, the conditions (discussed below) would be applied and a public comment period allowed for prior to construction.

1.404
Preconstruction review for smaller source is less complex. The review is limited to ensuring compliance with applicable emission limitations of the SIP. Air quality analysis, a public comment period, and compliance with the specified conditions are not

required. The interpretive rules mandate compliance with four main conditions:

- Lowest Achievable Emission Rate (LAER),
- More than equivalent emission reductions,
- Reasonable progress toward NAAQS achievement, and
- Compliance of all existing major sources in the State after 1 July 1979.

The LAER for a given source type is defined to be the lowest emission level achieved in practice or specified in a SIP, provided that the level does not exceed any applicable NSPS. While in many cases the LAER may be defined as equivalent with a given NSPS, the ruling specifies that cost must be accorded far less weight in defining the LAER than in determination of an NSPS.

1.405
The ruling further justifies this approach with regard to primary NAAQS by stating that "Congress and the Courts have made clear that economic considerations must be subordinated to NAAQS achievement and maintenance . . . and in the (Clean Air) Act does not allow economic growth to be accommodated at the expense of the public health." However, the ruling also expresses the EPA's intent to assess its economic impact during implementation and to consider whether mitigating adjustments can be made under the Act or through amendments. Programs toward achievement of NAAQS may be accomplished through emission reductions, including closure, at any facilities in the affected area under the same or separate ownership as that of the proposed source. The ruling emphasis that the "offset" emission reductions cannot be equivalent to the new source's emissions, but must exceed such emissions and thus result in reasonable progress toward attainment of the NAAQS. Further, any "offset" emission reductions must be in addition to reductions resulting from provisions of the Clean Air Act, such as reductions required by SIP and compliance with NSPS.

1.406
The 1977 Amendments allowed most of the interpretive ruling of 21 December 1976, pertaining to new sources in non-attainment areas to remain in effect until 1 July 1979. Two changes in the ruling, 1) a revised definition of "baseline," and 2) a provision for the Administrator to waive the offset requirements for certain States, are incorporated into the following discussion. The baseline emission level used to determine attainment or non-attainment and from which emissions offsets and reasonable further progress are measured is defined as ". . . the applicable implementation plan of the State in effect at the time of application for a permit . . . ." In the proposed project, this date is 31 December 1976. At that

time, all criteria pollutants were considered to be in an attainment status except hydrocarbons/photochemical oxidants. Thus, hydrocarbons/photochemical oxidants will be subject to the requirements discussed in this section.

1.407
The Amendments provide that the interpretive ruling may be waived by the Administrator for any pollutant for any State which has: 1) a program (based on a complete emissions inventory) which requires reductions in total allowable emissions prior to 1 January 1979 equivalent to reductions which would result from employing offset requirements, and 2) an enforceable permit program which requires new sources to meet emission limitations achievable through employment of LAER and requires existing sources to achieve emission reductions which may be obtained through use of reasonably available control technology. In summary, if a State's implementation plan can demonstrate that a given area's emissions reductions will be sufficient to meet and maintain NAAQS, the State need not employ offset requirements.

1.408
As discussed above, after 1 July 1979, new sources proposing to locate in non-attainment areas must comply with several requirements as incorporated into SIP's. Although the proposed project's current application schedule indicates that the permitting process will be completed by 1 July 1979, the major requirements potentially relevant to the project are summarized below in the event this is not the case.

- SIP's shall provide for attainment of primary NAAQS as expeditiously as practicable, but not later than 31 December 1982, with the exception that photochemical oxidant and carbon monoxide standards may be achieved as late as 31 December 1987, if necessary. These attainment dates must be used in determining the acceptability and conditions for construction of new sources in nonattainment areas.

- SIP's must identify and quantify emissions, if any, which will be allowed to result from new sources.

- SIP's must establish a program which requires, prior to issuance of a construction permit for a new source, and analysis of alternative sites, sizes, production processes and environmental controls. The analysis must show that the benefits of the proposed source significantly outweigh its environmental and social costs.

- SIP's must require permits for the construction and operation of any new, major stationary source in non-attainment areas. Permits may be issued if:

  (1) the permitting agency determines that -

  > "by the time the facility is to commence operation, total allowable emissions from existing sources in the region, from new sources which are not major emitting facilities, and from the proposed facility will be sufficiently less than total emissions from existing sources allowed under the implementation plan prior to the application for such permit to construct or modify so as to represent . . . reasonable further progress . . . ; or
  >
  > "that emissions of such pollutant resulting from the proposed new or modified major stationary source will not cause or contribute to, emissions levels which exceed the allowance permitted for such pollutant for such area form new or modified major stationary sources;

  (2) the proposed source is required to comply with the lowest achievable emission rate; and

  (3) the owner or operator of the proposed new or modified source has demonstrated that all major stationary sources owned or operated by such person (or by any entity controlling, controlled by, or under common control with such person) in such State are subject to emission limitations and are in compliance, or on a schedule for compliance, with all applicable emission limitations and standards under this Act."

h) Prevention of Significant Deterioration

1.409
Prior to adoption of the 1977 Amendments to the Act, the issue of significant deterioration (hereafter referred to as deterioration) was addressed primarily in regulations adopted in 1974. The Amendments incorporated directly into the Act "Prevention of Significant Deterioration of Air Quality" replace and differ subtantially in content from these regulations. Most of the newly adopted deterioration provisions pertain to only two of the criteria pollutants, particulate matter and sulfur oxide, since historically deterioration regulations pertained only to these pollutants. However, the new provisions also require that the remaining criteria

pollutants be evaluated by the EPA with regard to deterioration. The newly adopted deterioration provisions pertain to particulate matter and sulfur oxides in areas which do not exceed NAAQS. They are applicable to certain source categories, including iron and steel manufacturing facilities. The provisions define and control significant deterioration by classifying areas of the nation, establishing corresponding allowable deterioration increments, and providing for review of proposed new sources prior to construction. The review is to focus on several factors, including compliance with the allowable deterioration increment and technology requirements for application of BACT.

1.410

The regulations establish three area classifications (I, II, and III), and all areas of the country are classified accordingly for each pollutant. Class I areas include all international parks; national wilderness areas which exceed 5,000 acres in size; national memorial parks which exceed 5,000 acres in size; and national parks which exceed 6,000 acres in size which are in existence on the date of enactment of the Amendments of 1977, and all areas which were classified as Class I areas prior to this date. These areas may not be redesignated to other classes. All other areas of the nation are classified as II. However, States may redesignate any area as Class I. They may also redesignate most Class II areas to Class III upon compliance with certain conditions, including:

- The approval of the Governor of the State,
- The approval of affected local governments exhibited by enactment of legislation concurring with redesignation.
- State conducted hearings presenting an extensive description and analysis of the effects of redesignation, and
- Demonstration that redesignation will not cause or contribute to pollutant concentrations in any other area which exceed allowable increments or concentrations.

1.411

The following areas in excess of 10,000 acres may not be redesignated from Class I or II to Class III: national monuments, primitive areas, preserves, recreation areas, wild and scenic rivers, wildlife refuges, lakeshores and seashores, and parks and wilderness areas. Allowable deterioration increments are assigned to each of the three classes as shown in Table 1-50. Ambient pollutant concentration increments may not exceed these quantities more than once per year as measured from the ambient baseline equivalent to ambient air quality on 6 January 1975.

Table 1-50

Maximum Allowable Deterioration Increments

Pollutant	Class I (μg/m³)	Class II (μg/m³)	Class III (μg/m³)
Particulate matter:			
Annual geometric mean	5	19	37
24-hr. maximum	10	37	75
Sulfur dioxide:			
Annual arithmetic mean	2	20	40
24-hr. maximum	5	91	182
3-hr. maximum	25	512	700

1.412
To implement the above deterioration increment limitations and other relevant provisions of the Act, a preconstruction review procedure for new sources and for modification of existing sources is established. Prior to commencement of construction, a source review, commonly called the "Prevention of Significant Deterioration review" (PSD review) must be completed by the EPA (or delegated State agency) and a permit to construct or modify granted. The permit application must be granted or denied within one year of filing of the application and must include emissions limitations applicable to the facility.

1.413
Several of the criteria which must be met prior to granting of the permit include the following:

- The applicant must conduct an analysis in accordance with regulations to be promulgated within six months of enactment which demonstrates that the emissions from construction or operation of the facility will not cause, or contribute to, air pollution in excess of maximum allowable deterioration increments or national ambient air quality standards in any area, or any other emission or performance standards under the Act.

- A public hearing focused on the air quality impacts of the source must be held.

- The proposed facility must plan to employ BACT for each pollutant regulated under the Act.

- The applicant must conduct an analysis of any air quality impacts projected for the area as a result of growth associated with the facility.

1.414
During the interim period until applicable SIP's are revised to include the new deterioration provisions, the deterioration regulations promulgated in 1974 are to remain in effect. However, these regulations are amended to include the following provisions of the 1977 Amendments:

- The designated Class I areas (Section 162(a)).

- The maximum allowable increments (Section 163(b)), and

- The conditions which apply to redesignation of areas (Section 164(a)).

1.415
Since the applicable SIP's have not been revised as of this writing, and the regulations respecting the analysis required for the PSD review have not been promulgated, the PSD analysis for the proposed project, presented in the atmospheric regime section entitled "Impacts During Operations," has been conducted in accord with the 1974 Regulations. Under the 1974 Regulations, an analysis of growth and reduction in emissions since 6 January 1975 in the area affected by the proposed source must be conducted to determine whether the source will exceed the allowable deterioration increment. The analysis must consider all new and modified sources granted approval to construct, emission reductions from existing sources which contributed to the baseline air quality, and general commercial, residential, industrial, and other emission growth which has occurred since 6 January 1975. Growth resulting from the area's indirect sources during this time has been included in the analysis, while the projected increment in emissions from area growth resulting from the proposed facility has not been included.

1.416
In addition, to determine compliance with emissions levels reflecting BACT, the 1974 Regulations specify the emission level defined in the NSPS for the source category, or (where no NSPS exists as for certain processes of the proposed project) and alternative level determined on a case-by-case consideration of: process, fuels and new materials, engineering aspects of control technology adequately demonstrated, cost factors, siting considerations, and applicable State and local emission limitations. As mentioned above, the Amendments of 1977 provide that the EPA must undertake an evaluation of the other criteria pollutants, hydrocarbons, photochemical oxidants, carbon monoxide, and nitrogen oxides with respect to deterioration.

1.417
The Administrator must conduct a study and, not later than two years after enactment of the Amendments, promulgate regulations to prevent the significant deterioration of air quality which would result from the emission of these pollutants. These regulations will become effective one year after promulgation. Similar study and regulation requirements apply to any additional criteria pollutants so designated in the future. Additionally, the Amendments of 1977 require that within one year of enactment, the Administrator publish a guidance document to assist the States in making deterioration evaluations with respect to pollutants other than sulfur oxides and particulates. The guidance document must include recommended strategies for controlling photochemical oxidants on a regional or multi-State basis. Recommended legislative changes necessary to implement these strategies also must be prepared and presented to Congress.

Ohio Air Pollution Control Regulations

a) Particulate Matter and Sulfur Oxides Standards (OAC 3745-17)

1.418
These regulations set forth Ohio's ambient air quality standards for particulate matter and sulfur oxides, and establish emission standards with regard to these pollutants for fuel burning equipment and industrial processing. In addition, limitations are set for both fugitive and visible emissions. Ambient air quality standards for all criteria pollutants are shown in Table 1-51. Emission requirements relevant to the proposed project are discussed in the following paragraphs. Section 10 of the regulations places emission limitations on particulate emissions from sources in which fuel is burned for the primary purpose of producing heat or power by indirect heat transfer. As such, the limitations will apply to the project's power plant. Section 11 places restrictions on particulate emissions from processes which are not defined as fuel burning as above. These restrictions will apply to all of the project's raw materials processing operations, including coke batteries, and lime and sintering plants. Section 12 sets forth emission standards for sulfur compounds from industrial processes. The project's sulfur recovery plant will be regulated by this standard. The standard prohibits: 1) combustion and emission of gas streams that contain hydrogen sulfide in concentrations greater than 100 grains per 100 standard cubic feet of gas, and 2) sulfur oxide emissions from a sulfur recovery plant in excess of 0.01 pound per pound of sulfur processed. Section 13 sets sulfur emission limitations for installations in which fuel is burned primarily to produce heat or power by indirect heat transfer. As such, it is applicable to the project's power plant and by-products coke plant.

b) Carbon Monoxide, Photochemically Reactive Materials, Hydrocarbons and Related Materials Standards (OAC 3745-21)

1.419
These regulations established ambient air quality standards for Ohio for the above pollutants, and emission standards for volatile photochemically reactive materials and for carbon monoxide from stationary sources. These emission standards are summarized in the following paragraphs.

c) Permit to Install New Sources of Pollution (OAC 3745-31, former rule EP-30)

1.420
This regulation provides that a permit be issued by the Ohio EPA before commencement of construction of any new source of air pollution or water pollution, and prior to construction of solid waste

Table 1-51

Ambient Air Quality Standards - Ohio

Suspended Particulates

- The maximum annual geometric mean concentration shall not exceed sixty (60) micrograms per cubic meter.
- The maximum twenty-four (24) hour concentration not to be exceeded more than once per year shall be one hundred and fifty (150) micrograms per cubic meter.

Carbon Monoxide

- The maximum eight (8) hour arithmetic mean concentration not to be exceeded more than one (1) eight (8) hour period per year shall be ten (10) milligrams per cubic meter (9 parts per million by volume).

Photochemical Oxidants

- The maximum one (1) hour arithmetic mean concentration shall not exceed one hundred and nineteen (119) micrograms per cubic meter (0.06) parts per million by volume.
- The maximum four (4) hour arithmetic mean concentration not to be exceeded more than one (1) consecutive four (4) hour period per year shall be seventy-nine (79) micrograms per cubic meter (0.04 parts per million by volume).

Hydrocarbons

- The maximum three (3) hour arithmetic mean concentration of nonmethane hydrocarbons shall not exceed one hundred and twenty-six (126) micrograms per cubic meter (0.19 parts per million by volume measured as carbon) between the hours of six (6) AM and nine (9) AM.
- The maximum twenty-four (24) hour arithmetic mean concentration of nonmethane hydrocarbons not be exceeded more than one (1) day per year shall be three hundred and thirty-one (331) micrograms per cubic meter (0.50 parts per million by volume measured as carbon).

Sulfur Dioxide

- The maximum annual arithmetic mean concentration shall not exceed eighty (80) micrograms per cubic meter (0.03 parts per million by volume).
- The maximum twenty-four (24) hour concentration not to be exceeded more than once per year shall be three hundred and sixty five (365) micrograms per cubic meter (0.14 parts per million by volume).

disposal facilities. The scope and content of the regulation is discussed in the water pollution regulations section later in this chapter.

d) Air Permits to Operate and Variances (OAC3745-35, former rule EP-32)

1.421
These regulations require that a permit to operate be obtained from the Ohio EPA for each air contaminant source. Permit applications must contain sufficient information to determine compliance with all applicable rules and regulations, including a description of equipment and processes; the nature, source and quantities of uncontrolled and controlled emissions; the type, size, and efficiency of control facilities; and the impact of the emissions on existing air quality. Standards which must be met prior to granting permits provide that the applicant must demonstrate that:

- The source is in compliance with applicable rules and regulations;
- The source will not interfere with the attainment or maintenance of State and national AAQS;
- The source is equipped to monitor as required;
- The source was constructed in accord with the conditions of its permit to install; and
- Performance tests conducted within 90 days of start-up show that the source will operate in accord with Ohio and Federal laws, including the NSPS promulgated pursuant to Section 111 of the Clean Air Act.

e) Open Burning Standards (OAC 3745-19, former rule EP-12)

1.422
These standards are designed to control open burning of various types of waste in order to minimize air emissions and to ensure that no serious detrimental effects will occur to properties adjacent to the burning or to the occupants thereof. They will apply to all open burning within Ohio associated with the proposed project, particularly the proposed burning of landscape wastes during the construction phase. The standards define so-called "restricted areas" and specify types of open burning permitted in each area. Restricted areas are defined as ". . . the area within the boundary of any Municipal Corporation . . . plus a zone extending one mile beyond such Municipal Corporation having a population of 10,000 persons or more . . . ." Unrestricted areas are defined as all areas

outside the boundary of restricted areas. The burning of landscape wastes such as will be cleared from the project area, including any vegetable or plant matter, trees, stumps, brush, etc. is allowed only in unrestricted areas upon receipt of written permission by the Ohio EPA. In addition, the burning may occur only if certain conditions are observed:

- The fire is set only when atmospheric conditions will readily dissipate contaminants;
- The fire does not create a visibility hazard on roadways, railroad tracks or air fields;
- The fire is located at the point most remote from residential areas, no less than 1,000 feet from such areas; and
- An air curtain destructor or other equally effective device is used to control emissions.

Pennsylvania Air Pollution Control Regulations

a) *Pennsylvania Air Pollution Control Act (P.L. 2119)*

1.423
Pennsylvania's Air Pollution Control Act imposed broad powers and duties upon the Pennsylvania Department of Environmental Resources (DER) under which air pollution may be controlled through various regulations. The Act sets forth the Commonwealth's policy to protect its air resources to the degree necessary for the protection of the public health, plant and animal life, its recreational resources, the public comfort and convenience, and the development and expansion of industry, commerce and agriculture. Written approval from the DER is to be obtained prior to construction of any stationary air contamination source and a permit to operate such a source must be obtained prior to commencement of operations. Requirements, terms and conditions of the approval, and permit are discussed in the following section.

b) Construction, Modification, Reactivation, and Operation of Sources (Title 25, Chapter 127)

1.424
This chapter sets forth the procedures and requirements for obtaining approval to construct and a permit to operate any source of air contamination. Approval to construct such a source may be granted by

the DER following compliance with the following requirements of application:

- Provision of information necessary to thoroughly evaluate the source.

- Demonstration that the source will not interfere with attainment or maintenance of ambient air quality standards and will comply with all State and Federal requirements.

- Provision that the source will employ best available technology, and

- Demonstration that the source can adequately monitor and record its emissions and any operating conditions which affect the emissions.

The permit to operate may be issued following renewed compliance with all of the above requirements as well as with the following:

- Demonstration that construction of the source was accomplished in accordance with the conditions of its approval to construct; and

- Demonstration that the source and its air cleaning devices are capable of being, and will continue to be, operated so as not to cause violation of ambient air quality standards.

c) Ambient Air Quality Standard (Title 25, Chapter 131)

1.425
Pennsylvania's ambient air quality standards include the NAAQS as well as those shown in Table 1-52 which are maximum values not to be exceeded.

d) National Emission Standards for Hazardous Air Pollutants (Title 25, Chapter 124)

1.426
This chapter allows the Pennsylvania DER to individually adopt the National Emission Standards for Hazardous Air Pollutants (NASHAP) established under Section 112 of the Clean Air Act. Formally adopting these Standards enables Pennsylvania to enforce them independent of Federal enforcement. To date, Pennsylvania has adopted all promulgated NESHAP, including asbestos, beryllium, mercury, and vinyl chloride.

e) Standards for Contaminants (Title 24, Chapter 123)

Table 1-52

Pennsylvania Ambient Air Quality Standards

Contaminant	Concentrations Averaged Over 1-Year	 30-Days	 24-Hours	 1-Hour
Settled particulate (total)	0.8 mg/cm^2/mo.	1.5 mg/cm^2/mo.	-	-
Lead	-	5 μg/m^3	-	-
Beryllium	-	0.01 μg/m^3	-	-
Sulfates (as H_2SO_4)	-	10 μg/m^3	30 μg/m^3	-
Fluorides (total soluble, as HF)	-	-	5 μg/m^3	-
Hydrogen sulfide	-	-	0.005 ppm	0.1 ppm

Source: Pennsylvania Department of Environmental Resources.

b) Standards of Performance for New Sources

1.432
Section 306 of the Act requires the promulgation of regulations which establish Standards of Performance for New Sources within each of 28 source categories. One of these categories is the iron and steel manufacturing category. Regulations establishing New Source Performance Standards for Phase I of the iron and steel manufacturing category became effective 29 June 1974. Subsequently, on 7 November 1975, in response to a challenge by the American Iron and Steel Institute and affiliated companies, parts of the regulations were remanded by Court decision. Issues central to the challenge included disagreements regarding designation of certain technologies as BADCT (Best Available Demonstrated Control Technology). Each subpart established standards for a specific manufacturing process. The seven subparts which are applicable to the proposed project are: A - By-Product Coke, C - Sintering, D - Blast Furnaces (iron), G - Basic Oxygen Furnace (Wet Air Pollution Control Methods), L - Continuous Casting and Pressure Slab Molding O - Hot Forming - Flat Subcategory, and V - Miscellaneous Runoffs-Storage Piles, Casting, and Slagging. The standards are to reflect the greatest degree of effluent reduction achievable through application of Best Available Demonstrated Control Technology (BADCT). In establishing the standards, the Administrator must consider cost, nonwater quality environmental impact, and energy requirements. On 10 August 1977, the Government amended its decision concerning the Phase I regulations but did not affect the remainder of the NSPS. Regulations establishing NSPS for Phase II were proposed on 29 March 1976, and as yet, have not been promulgated. As a result, there are no effective NSPS regulations in existence for either Phase I or Phase II at this time. However, it is contemplated that NSPS will be effective prior to the issuance of any NPDES permits for the proposed facility. The effluent limitations required of the project as of October 1977 are presented in the Wastewater Treatment Systems section of this chapter. Should the NSPS be included in the permit issued for the proposed project, the project's permit terms would not be subject to near-term revision. Section 306 of the Act provides that new sources constructed to meet NSPS will not be subject to more stringent, subsequent standards within a ten-year period following completion of construction.

c) Effluent Standards for Toxic Pollutants

1.433
Section 307 of the Act requires a listing and subsequent promulgation of effluent standards for toxic pollutants. Inclusion of a pollutant as toxic is to be based on considerations of toxicity, persistence, and degradability, and on biological effects in receiving waters.

Section 307 further requires that a public hearing be held prior to final promulgation of standards, but does not require that economics be considered in standard setting. In 1973, the EPA listed nine toxic pollutants and proposed effluent standards. However, final standards were not promulgated. Subsequently, environmental groups, including the National Resources Defense Council (NRDC), the Environmental Defense Fund (EDF), and Citizens for a Better Environment brought suit against the Administrator for failure to meet the requirements of Section 307 and related sections of the Act. In June 1976, the resulting settlement agreement (National Resources Defense Council, Environmental Defense Fund, and Citizens for a Better Environment et. al. versus Russell E. Train, U.S. District Court for the District of Columbia, Settlement Agreement, 7 June 1976) required promulgation of new regulations establishing Effluent Guideline Limitations (EGL) for existing sources and standards of performance of new sources for 65 specific chemicals and chemical classes in 21 categories of sources (including iron and steel manufacturing). The initial list has been expanded to include 129 chemicals and classes some of which are listed in the Surface Water impacts section of Chapter Four. Regulations for the iron and steel promulgated not later than 31 March 1979. The proposed steel plant would be subject to new source standards whether permits are issued before or after the promulgation of the EGL regulations. New source standards must reflect the greatest degree of effluent reduction achievable through the application of BADCT and must be achieved at the commencement of new source operation. The EGL must be achieved at the earliest possible time, but in no case later than 30 June 1983. Section 311 of the Clean Water Act (P.L. 92-500) is administered by the Coast Guard in cooperation with EPA. Such act covers onshore as well as offshore facilities. Title 40, CFR 110.3 indicates that no visible sheen is permissible.

d) Thermal Discharge

1.434
Section 316(a) pertaining to thermal discharges provides that the Administrator of the USEPA may impose a thermal effluent limitation other than that specified by the NPDES permit authority (Ohio EPA), if the source owner or operator demonstrates satisfactorily that the proposed limitation is "more stringent than necessary to assure the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made." The applicable Ohio regulations apply similar standards for evaluation of thermal discharges as those expressed in Section 316(a), i.e., the standard of protection of aquatic life. Representatives of the Ohio EPA have indicated that NPDES permit decisions for thermal discharges are based on criteria similar to those used in evaluation of 316(a) demonstrations, as

outlined in the EPA guidance document, "316(a) Technical Guidance-Thermal Discharges."

1.435
During the course of this study, representatives of the U.S. Steel Corporation met with the U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, the USEPA, and Ohio EPA to discuss consideration of Section 316. The results of this study and those meetings indicate that the proposed thermal effluent would meet applicable thermal standards under Ohio law and that there would be no need to invoke Section 316(a). This is a preliminary determination, and the applicability of Section 316(a) can only be determined during the NPDES permit application/granting phase which will not take place until detailed design of the plant is completed.

1.436
Section 316(b), primarily administered by the USEPA in cooperation with U.S. Fish & Wildlife Service, requires that cooling water intake structures "reflect the best technology available for minimizing adverse environmental impact" in their location, design, construction, and capacity. Analysis of the impacts from the intake structures was conducted with reference to available USEPA and U.S. Fish and Wildlife Service guidance documents.

e) Water Quality Certification

1.437
Section 401 of the Clean Water Act requires any applicant for a Federal license or permit proposing to discharge a pollutant into waters of the United States to obtain a certification from the State in which it occurs, that the discharge will comply with applicable effluent limitations and water quality standards. All such certification for construction must also pertain to the subsequent operation of the facility. The Corps of Engineers requires that all applicants proposing to discharge dredged or fill material into waters of the United States secure a water quality certification from the State in which the activity occurs. When the work proposed may affect the waters of an adjacent State, the certification is forwarded to the USEPA Regional Administrator who shall determine the overall impact on water quality. No Corps permit can be granted until the required certification has been obtained or waived by the State involved.

f) The National Pollutant Discharge Elimination System (NPDES)

1.438
Section 402 of the Act establishes a permit system (NPDES) to regulate the discharge of any pollutant from new or existing sources.

Through this section of the Act, the primary responsibility for regulating the discharge of pollutants was transferred from the U.S. Army Corps of Engineers (as authorized by the Rivers and Harbors Act of 1899) to the USEPA in 1972. Conditions of NPDES permits must ensure compliance with all applicable provisions of the Act, including Standards of Performance for New Sources, data collection, reporting, monitoring, and inspection. Issuance of NPDES permits must be preceded by the opportunity for public hearings. The EPA may retain NPDES permitting authority or delegate such authority to the States. States desiring to administer the permit program must demonstrate adequate authority and resources to carry out provisions of the Act, including authority and resources to issue permits, inspect, monitor and enter sources, require reports and recordkeeping, and enforce compliance and abatement of violations. The Ohio EPA has sought and received approval to administer the NPDES program in Ohio. As such, decisions regarding the NPDES needed by the proposed project for its outfall into the Ohio portion of Lake Erie will made by this agency subject to review by the EPA.

g) Section 404 of the Clean Water Act

1.439

This section prohibits the discharge of dredged or fill material into waters of the United States unless permits are first secured from the U.S. Army Corps of Engineers. Applications for Section 404 permits are evaluated using guidelines developed by the Administrator of the U.S. Environmental Protection Agency in conjunction with the Secretary of the Army. The Chief of Engineers can make a decision to issue a permit that is inconsistent with those guidelines if the interests of navigation require it. However, Section 404(c) gives the Administrator of the USEPA further authority, subject to certain procedures, to restrict or prohibit the discharge of any dredged or fill material that may have an unacceptable adverse impact on municipal water supplies, shell fish beds, fishery habitat (including spawning and rearing areas), wildlife or recreational areas. On 27 March 1975, the District Court for the District of Columbia ordered revocation and rescission of that part of the Department of the Army's regulation which limited permit jurisdiction (under Section 404) to traditionally navigable waters of the United States. On 25 July 1975, the Corps of Engineers published interim regulations in the Federal Register and after further review developed final regulations which were published on 19 July 1977. Certain aspects of the proposed project involve the placement of fill materials in Lake Erie and its tributaries and are, therefore, subject to regulation under this section. Activities subject to the authorization include the proposed extension of the Conneaut Harbor East Pier, construction of an unloading dock to join the East Pier, installation of the effluent outfall and water intake structures, construction of the

supporting structures for the raw materials conveyor system which will span the harbor between the shore terminus of the dock and the shoreline, and culverting of Turkey Creek.

The Safe Drinking Water Act (PL 93-523)

1.440
This law was enacted 16 December 1974 for the purpose of assuring a safe drinking water supply for public use. Administered by the EPA, the Act's provisions apply to public water systems which are defined to include "a system for the provision to the public of piped water for human consumption . . . which regularly serves at least twenty-five individuals." As such, the law would apply to the proposed project's water supply which would provide potable water to all appropriate project facilities. The focus of the Act is largely limited to regulating water quality at the point of delivery to users of public water systems. As such, water quality is measured at the point of delivery, rather than at the point of origin of the water supply, such as at natural ground or surface water locations. The Act requires promulgation of national primary and secondary drinking water regulations applicable to public water systems at their delivery point to protect the public health and welfare. The regulations must specify contaminants, maximum contaminant levels and criteria and procedures to assure a supply of drinking water which complies with the maximum contaminant levels.

1.441
The primary regulations (40 CFR 141; 40 FR 59565, 12/24/75) have been promulgated and specify maximum contaminant levels for variety of inorganic and organic chemicals, turbidity and microbiological organisms. They would apply to the proposed project unless a variance or exemption is obtained. Variances and exemptions can be granted if it is shown that 1) an unreasonable risk to health will not result and that 2) characteristics of the raw water supply are such that the regulations cannot be met despite application of the best technology. Secondary regulations, addressed to the esthetic qualities of drinking water, were proposed in the March 1977. These particular regulations are intended as guidelines for the States. Although regulation under the Act generally occurs at the point of delivery, Part D provides authorization to regulate the quality of water supply sources in emergency situations. This Part provides the Administrator with emergency powers to "take such actions as he may deem necessary" to protect the health of the public upon receipt of information that a contaminant is present or is likely to enter a public water system which may present an imminent and substantial endangerment of the public's health. Actions which the Administrator may take include "1) issuing such orders as may be necessary to protect the health of persons who are or may be users of such system ...

and 2) commencing a civil action for appropriate relief, including a restraining order or permanent or temporary injunction." Since the proposed project will discharge into Lake Erie, a water supply source for many communities, regulation could occur under Part D.

1.442
Enforcement powers under the Act may be delegated to States by the USEPA. To receive responsibility, States must adopt drinking water regulations no less stringent than the national regulations; have adequate enforcement procedures, including authority and resources to perform or require monitoring, inspections, and recordkeeping and reporting; have variance and exemption requirements no less stringent than those contained in the Act; and be able to assure a safe drinking water supply under emergency circumstances. The water intake structure and supply plant for the proposed plant will be located in Ohio. The Ohio EPA has sought but has not yet received primary enforcement responsibility; thus, Region V of EPA currently administers the Act in Ohio. However, the proposed facility can be regulated by either agency whichever holds enforcement responsibilities during its lifetime.

Section 10 of the River and Harbor Act of 1899 (33 U.S.C.401-413)

1.443
The River and Harbor Act, administered by the U.S. Army Corps of Engineers (USCOE) was originally passed in 1899. Over the years, the Act has been amended numerous times, altering both its regulatory scope and procedures. Section 10 of this Act specifically identifies the types of structures or activities in or affecting navigable waters that are prohibited unless permitted by the Corps of Engineers. Permits are required for structures in navigable waters such as piers, breakwaters, bulkheads, revetments, power transmission lines, and aids to navigation; and activities such as dredging and stream channelization, excavation, and filling. In addition, work performed outside the limits of navigable water which affects its navigable capacity may also require a permit under this section. Waters subject to regulation under Section 10 in the vicinity of the project site include Lake Erie, Conneaut Harbor, and Conneaut Creek upstream to the Bessemer and Lake Erie Railroad swing bridge. Activities associated with the proposed project which are subject to regulation under Section 10 of the Act include: 1) extension of the Conneaut Harbor East Pier, construction of a cellular sheet pile unloading dock to join the East Pier and associated dredging, 2) installation of the effluent outfall and outer intake structures, and 3) installation of a raw materials conveyor system which would span the navigable waters of Conneaut Harbor between the shore terminus of the dock and the existing shoreline.

The Ports and Waterways Safety Act of 1972: (PL 92-340)

1.444
The Ports and Waterways Safety Act, enacted 10 July 1972, is administered by the United States Coast Guard. The purpose of the Act is to promote the safety and environmental quality of ports, harbors, waterfront areas and navigable waters of the United States. The Act is designed to achieve its purpose by authorizing promulgation of regulations and rules which will 1) control various operations of vessels and general vessel traffic and 2) provide comprehensive minimum standards for design, construction, alteration, repair, maintenance and operation of vessels engaged in transport of certain bulk liquid cargoes, including any cargo which is inflammable or combustible or any form of oil, including petroleum, fuel oil, sludge, oil refuse and oil mixed with wastes other than dredged spoil. Such rules and regulations apply to foreign as well as domestic vessels and promulgation was to occur "as soon as practicable." The rules and regulations governing general vessel traffic would apply to all vessels associated with the project. Those applicable to carriers of bulk liquid cargoes would regulate project related vessels carrying petroleum, including fuel oil and Bunker-C oil.

Ohio Water Regulations

1.445
The primary Ohio water regulations relevant to the proposed project are as follows: Water Quality Standards (OAC 3745-1, former rule EP-1); Permits to Install (OAC 3745-31, former rule EP-30); Ohio NPDES Permits (OAC 3745-33, former rule EP-31); and Miscellaneous Water Supply Regulations (OAC 3745-6, former rule HE-35). Table 1-53 summarizes the scope of these regulations and shows the principal applications of each statute (regulation) to the proposed project. In addition, each statute is discussed further in the immediately following sections.

a) Ohio EPA Regulation: Water Quality Standards (OAC 3745-1)

1.446
Ohio Regulation OAC 3745-1 became effective 8 January 1975. As of this writing, revisions to certain sections have been proposed by the Ohio EPA but have not have been approved. The current regulation classifies all surface waters of the State "as appropriate to warm water fisheries, for primary contact recreation, for processing by conventional treatment into public, industrial, and agricultural water supplies, and for such other uses as are identified for specific waters . . ." OAC 3745-1 further establishes water quality standards for many parameters, defines mixing zone limits and standards and prohibits degradation of waters such that they lose any existing

Table 1-53

Ohio Water Legislation

Legislation	Summary Scope of Legislation	Application to Proposed Project
Ohio EPA Regulation: Water Quality Standards (OAC 3745-1)	Classifies all surface waters for use. Establishes water quality standards for all water, including separate standards for Lake Erie-except specified harbors, including Conneaut Harbor. Defines mixing zone limits and standards.	Combined outfall to Lake Erie of wastewater treatment plants (all process waste streams, cooling tower blowdown and sanitary wastes), and roof drainage.
Ohio EPA Regulation: Permits to Install (OAC 3745-31)	Requires a permit to be given for installation of any new or modified source of water or air pollutants and for installation of waste disposal facilities. Primary requirement for permits is compliance with all applicable state and Federal statutes.	The effluent discharge to Lake Erie described above. All air emission sources located in Ohio, including the sinter plant, coke ovens, coke oven gas cleaning plant, and the coal blending, ore storage and oil storage areas. Wastewater holding ponds, if constructed.
Ohio NPDES Permit Regulations (OAC 3745-33)	Requires issuance of an NPDES permit for all discharge to Ohio waters. Primary requirement for permits is compliance with all applicable state and Federal statutes.	The effluent discharges to Lake Erie described above.
Miscellaneous Water Supply Regulations (OAC 3745-6)	Requires approval by the Department of Health of water supply systems.	Water supply plant and system.

use capability. Separate sections of OAC-3745-1 are addressed to water quality standards applicable to Lake Erie and to cold water fisheries, including Conneaut and Turkey Creeks. The proposed revised standards are designed to protect Lake Erie as exceptional warmwater habitat, public water supply, agricultural water supply, industrial water supply, and bathing waters. Limitations on the size and location of mixing zones have been revised to the effect that mixing zone definitions will be made on a case-by-case basis restricted primarily by the protection of certain sensitive use areas. Values not to be exceeded have been made less stringent for several parameters, while pH, total dissolved solids, cyanide (A), chromium, zinc, arsenic, lead, mercury, and fluoride standards have been revised such that they more nearly coincide with IJC objective. Conneaut Harbor and the dredged portion of Conneaut Creek are exempted from the Lake Erie standards and are regulated by separate standards.

b) Ohio EPA Regulation Permits to Install (OAC 3745-31)

1.447
Although relatively brief and simple in format, OAC 3745-31 provides the Ohio EPA with broad and comprehensive authority over three types of new sources: solid waste disposal facilities, water treatment works, and sources of air pollutants. The Regulation provides that a permit, called a Permit to Install, be granted before construction begins. The regulation would apply to all discharges of the proposed project into Ohio's water and air environments and to any waste disposal facilities located in Ohio. As such, the project's wastewater treatment facilities would be regulated under OAC 3745-31 as would sources of air emissions including the sinter plant, coke ovens, coke oven gas cleaning plant, and the coal blending, ore storage and oil storage area. The Regulation sets forth criteria used by the Director of the Ohio EPA in decisions regarding permits; the primary criteria being that installation will "not result in violation of any applicable laws," including rules and regulations of the Ohio EPA, the USEPA, the Federal Clean Air Act, and the Clean Water Act. In addition, consideration may be given to the short and long-term impact of the source on environmental quality and the social economic impact of granting or denying the permit.

c) Ohio NPDES Permit Regulations (OAC 3745-33, former rule EP-31)

1.448
In 1973, the Ohio EPA adopted regulations in accord with requirements of Section 402 of the Clean Water Act, which allowed Ohio to assume responsibility for the National Pollutant Discharge Elimination System (NPDES) permitting activities. The regulations require that each source of pollutant discharge be regulated under an NPDES permit. Although each point source must be regulated by specific

discharge limitations and other appropriate requirements, a single permit may be given for all discharges from a given facility.

Several criteria must be met before any permits can be issued. These are summarized below:

- Anticipated discharge levels must be in compliance with all applicable water quality standards, effluent limitations (including the standards of performance for new sources pursuant to Section 306 of the Act), national toxic and pretreatment effluent limitations pursuant to Section 307 of the CWA, and any more stringent requirements under any applicable laws - including requirements necessary to comply with a plan for area-wide waste treatment management approved pursuant to Section 208 of the Act;

- Authorized discharge levels specifying the average and maximum daily quantitative limitations must be defined. The discharge levels must be characterized to the extent possible, describing where appropriate the pollutants in terms of volume, weight in pounds per day, duration, frequency, and concentration; and

- Adequate provisions for monitoring and performance tests must be made.

1.449
The regulations also detail certain conditions and requirements which must be contained in each permit. The primary conditions are as follows:

- All discharges must be consistent with permit terms.

- Facility expansions, production increases, and modifications resulting in new or increased discharges of pollutants must be reported.

- Monitoring, recordkeeping, reporting, and inspection shall occur as required.

- Wastewater treatment facilities will be maintained so as to operate at optimum levels.

1.450
General provisions of the regulations specify that permit applications must be approved or denied within 180 days of satisfactory application and permits may be effective for a period up to five

years. Sources constructed to meet all applicable standards of performance will not be subject to more stringent standards for a 10-year period beginning on the date of completion of construction or during the period of depreciation or amortization of the facility, whichever is shorter, with the exception of toxic effluent standards issued pursuant to Section 307 of the CWA. If a toxic effluent standard or prohibition is established which applies to any permitted facility, that facility's permit must be modified to require compliance with the standards.

d) *Miscellaneous Water Supply Regulation* (OAC 3745-6)

1.451
These regulations set forth general requirements which apply to all facilities supplying potable water. The regulations require that water supply systems receive the approval of the Ohio Department of Health, and only in a general manner specify design standards for such facilities. Areas addressed by the regulations include independence of water systems, service pipes, distributing systems, backflow protection, water storage tanks, and water treatment agents. These regulations would apply to the plant water system, which would supply potable water of Lake Erie origin to all portions of the facility.

Pennsylvania Water Regulations

1.452
The primary Pennsylvania statutes relevant to the proposed project pertain to water pollution control, namely, the Clean Streams Law, the Erosion Control Rules and Regulations, and the Water Obstructions Act. These statutes are summarized in Table 1-54 which lists the principal applications of each to the proposed project.

a) Pennsylvania Clean Stream Law(s) (PL 1987, as amended)

1.453
Administered by the Pennsylvania Department of Environmental Resources (DER), the Clean Streams Law is focused on preservation and restoration of "the purity of the waters of the Commonwealth for the protection of public health, animal and aquatic life, and for industrial consumption and recreation." By defining "waters of the Commonwealth" to include both surface and underground water, the Act is sufficiently broad in scope to regulate potentially polluting discharges from most sources. Several provisions of the Law, as well as the regulations promulgated pursuant to these provisions, would be applicable to aspects of the proposed project which could cause polluting discharges into Pennsylvania waters. Specifically, these provisions are contained in Sections 301 and 307 which pertain to Industrial Waste Discharges, Section 316 - Responsibilities of Landowners and Land Occupiers, Section 401 - Prohibition Against

Table 1-54

Pennsylvania Water Legislation

Legislation	Summary Scope of Legislation	Application to Proposed Project
Pennsylvania Clean Streams Law (PL 1987)	Provides general authority for protection and restoration of surface and ground water quality. Authority is exercised under the regulations pertaining to erosion control (below) and solid waste management (Section 1.14.7.3.2).	Discharge of collected runoff to Lake Erie tributaries All project activities that could affect surface and groundwaters.
Erosion Control Rules and Regulations (Title 25, Chapter 102)	Controls accelerated erosion and resulting sedimentation by requiring submission and approval of a detailed plan for all earthmoving activities.	All project activities occurring in Pennsylvania involving earthmoving, including general construction and installation of waste disposal areas.
Water Obstructions Act (PL 555, Section 4)	Requires permit for construction of any hydraulic structure, including dams, obstructions and other structures located along, across or projecting into all streams and bodies of water.	All stream utility crossings, culvertings, bridge constructions, and filling and diversions.
	Requires permit for changes in the course, current or cross section of any streams.	Culverting of Turkey Creek.

Other Pollutions, and Section 501 - Protection of Domestic Water Supplies. Sections 301 and 307 pertaining to industrial waste discharges provide authority for the Pennsylvania Solid Waste Disposal Rules and Regulations discussed later in this section. These sections and the Rules and Regulations may be applicable to the project's solid waste area in order to prevent both ground and surface water pollution. Sections 316, 401 and 501 are general provisions which prohibit pollution.

b) Erosion Control Rules and Regulations (Title 25, Chapter 102)

1.454
These Rules and Regulations (hereafter referred to as Regulations), administered by the Pennsylvania Department of Environmental Resources (DER), were adopted in 1972 for the general purpose of preventing pollution of the waters of the Commonwealth. They focus on controlling accelerated erosion and the resulting sedimentation of water by placing requirements on most earthmoving activities which affect an area greater than 25 acres. The portion of the proposed plant located in Pennsylvania would be subject to these Regulations. The Regulations require that prior to beginning earthmoving activities a comprehensive erosion and sedimentation control plan be prepared, approved by the DER, and a permit for the activity be issued. For most activities, the permit is limited to erosion and sedimentation control. However, for activities which also are regulated by the Pennsylvania Water Obstructions Act, as would be the proposed project, the permit issued under the Act covers both erosion and sedimentation control and installation of water obstructions. The plans must be prepared by persons trained and experienced in erosion and sedimentation control measures and techniques. Plans must include design, implementation and maintenance of effective control measures during the construction phase and extend through completion of stabilization and restoration phases. The Regulations set forth the factors to be considered in plan development, and specify control measures and facilities appropriate for various situations.

1.455
Factors which must be considered in development of such a plan include:

- topographic features of the project area;
- types, depth, slope and area extent of the soils;
- runoff from the project area and the upstream watershed area;
- staging of earthmoving activities;

- temporary control measures and facilities for use during earthmoving;

- permanent control measures and facilities for long-term protection; and,

- a maintenance program for the control facilities, including disposal of materials removed from the facilities or the project area.

1.456
Acceptable control measures include limiting exposed areas, surface water diversion, velocity control, interim and permanent stabilization, collection of runoff, and solids separation. Control facilities for which certain design criteria are given include diversion terraces, interceptor channels or conveyance, and sedimentation basins.

c) Water Obstructions Act (PL 555, Section 4, as amended)

1.457
Pennsylvania's Water Obstructions Act is focused on protection of the public's safety as well as on protection of the Commonwealth's water and related environments. First passed in 1923, the Act has been amended on several occasions and is currently administered by the Department of Environmental Resources. The Act's primary focus is regulation of hydraulic structures, including dams, obstructions and other structures which are located "along, across, or projecting into all streams and bodies of water wholly or partly within...the Commonwealth..." and changes in the course, current or cross section of any streams. The Act defines "obstructions" to encompass dams, walls, wing-walls, wharves, embankments, abutments, projections, bridges, and any other obstructions. Permits are required for construction of any water obstruction and for changes in the course, current or cross section of any stream or body of water. Permits may contain any conditions, regulations or restrictions the DER deems necessary. Although one permit may be given for all obstructions associated with a particular project, in practice one permit is usually given for construction of each obstruction. Several aspects of the proposed project would require permits under the Water Obstructions Act including stream utility crossings, small bridges, filling of intermittant unnamed streams and the culverting of Turkey Creek and its tributaries.

1.458
The Act specifies numerous criteria applicable to design, operation and maintenance of structures and obstructions which must be met when

a permit application is submitted. Applications for relatively simple projects, such as a single utility crossing under a small stream, can meet these criteria by submitting a minimum amount of technical information. However, most projects (such as small bridges, culverts, channel changes, flood control structures, fills, walls, bulkheads, utility crossings, outfalls and intakes), require additional information including engineering plans, cross sections, profiles, a hydrologic study, a hydraulic study, watershed information and, where relevant, information on current and projected urbanization of the area. Other projects (including major bridges, enclosures, channel changes or flood plain developments) may require still additional information such as backwater studies and environmental reports because of their scope, potential impact or complications. Finally, applications for all projects of any size must be accompanied by an erosion and sedimentation plan which meets the requirements of Pennsylvania's Erosion and Sedimentation Control Rules and Regulations discussed in the previous section.

International Water Regulations, Standards, Agreements and Policies

International Joint Commission Objectives

1.459
The Great Lakes Water Quality Agreement of 1972 between Canada and the United States empowered the International Joint Commission (IJC) to recommend specific water quality objectives for the Great Lakes. The objectives do not have legally enforceable status but are agreed upon by the lake States and Canada as goals for the Great Lakes. In developing water quality objectives the IJC adopted a policy of protecting all uses of the lake. As such, for most parameters the objectives are recommended to protect aquatic life. In other cases, the most sensitive use which constrains a water quality parameter is public water supply, or aesthetic, or recreational uses. Two types of objectives were established in the 1972 Agreement: those which are more qualitative and general and those which are quantitative and specific to numerous parameters.

1.460
The qualitative objectives state that the boundary waters of the Great Lakes System should be:

- Free from substances that enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life or waterfowl;

- Free from floating debris, oil, scum, and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or deleterious;
- Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance;
- Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life; and
- Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae.

1.461
More quantitative objectives are provided for each of the following parameters: total and fecal coliforms, dissolved oxygen, total dissolved solids, taste and odor, pH, total iron, phosphorous, and radioactivity. Further, the Agreement also contains more general use-oriented objectives for temperature, mercury and other toxic heavy metals, persistent organic contaminants, settleable and suspended materials, and oil, petrochemicals, and immiscible substances. There are also general policies covering nondegradation, mixing zones, and sampling data. New additional objectives and revisions of current objectives were proposed in September 1976 and in January 1977. Included are the addition or revision of objectives for the following pollutants: eleven pesticides, phthalic acid esters, polychlorobiphenyls, arsenic, cadmium, chromium, copper, cyanide, iron, lead, mercury, nickel, selenium, zinc, fluoride, total dissolved solids, cyanide, oil and petrochemicals, complex effluents, ammonia, chlorine, hydrogen sulfide, dissolved oxygen, pH, temperature, nutrients, tainting substances, settleable and suspended solid, and asbestos. Also new policies on nondegradation, and mixing zones are proposed.

Solid and Hazardous Waste Regulations

The Federal Resource Conservation and Recovery Act (PL 94-580)

1.462
The new Resource Conservation and Recovery Act (RCRA) was signed into law in October 1976 and is administered by the EPA. The Act is landmark legislation in the area of waste management as it provides for comprehensive and direct regulation of hazardous wastes; Federal guidance, and financial and technical assistance to States for formulation and implementation of area and regional plans for solid

waste management; a program to eliminate open dumping; and authority for research, demonstrations, and studies. The Act provides for regulation of the proposed project under Subtitle C, Hazardous Waste Management, and under Subtitle D, State or Regional Solid Waste Plans, which includes provisions pertaining to open dumping. Both hazardous and nonhazardous wastes may be generated by the proposed project. For the hazardous wastes, the proposed project must comply with the "Standards Applicable to Generators of Hazardous Waste." If the wastes are disposed of onsite, the project must comply additionally with the "Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities," and the permit requirements for owners and operators of hazardous waste facilities.

1.463
The disposal area selected for nonhazardous wastes (whether it be onsite or offsite) would be regulated by Subtitle D of the Act which prohibits the establishment of open dumps. Any land disposal site not classified as a hazardous waste facility must meet the criteria established for sanitary landfills.

1.464
Subtitle C, Hazardous Waste Management, provides for comprehensive regulation of hazardous wastes. This subtitle directs the EPA, within 18 months of enactment (i.e., by 21 April 1978) to promulgate criteria for classifying wastes as hazardous and to develop an initial listing which must be revised from time to time) of wastes which will be subject to regulation. On 18 December 1978, the USEPA published "Proposed Guidelnes and Regulations and Proposal on Identification and Listing - Hazardous Waste." The following substances produced through the coking process are proposed for listing as hazardous wastes: decanter tank tar, decanter tank pitch sludge, oleum wash waste, caustic neutralization waste, and ammonia still lime sludge. These wastes are proposed for regulation under Subtitle C. Additional wastes listed as "hazardous" that could potentially be generated during the proposed plant's construction and maintenance include: waste chlorinated hydrocarbons from degreasing operations, waste nonhalogenated solvents, waste lubricating oil, waste hydraulic or cutting oil, paint wastes, and water-based paint wastes. Solid wastes generated by the proposed steel plant power facility (fly ash, bottom ash, scrubber sludge) are proposed for regulation as "special wastes." Proposed rule making for special wastes will be published at a later date. The criteria for hazardous waste, take into account toxicity, persistence, degradability in the environment, potential for accumulation in tissue, factors such as flammability and corrosiveness and other hazardous characteristics. Within 90 days of promulgation of regulations identifying and

listing hazardous wastes, persons generating or transporting any such substances or owning or operating a facility for treating, storing, or disposing of such substances must file with the EPA or the regulating State, a notification describing their activities. The proposed rules published in the Federal Register on 18 December 1978 standards for generators and transporters of hazardous wastes and for owners and operators of hazardous waste treatment, storage, and disposal facilities. The primary standards for generators and transporters include recordkeeping and reporting requirements regarding quantities and types of waste generated and transported, use of a manifest system to assure disposal of all generated wastes in permitted facilities, and adequate labeling of wastes. The performance standards for facility owners and operators include requirements respecting facility location, design, construction and operation, recordkeeping, and reporting of waste quantities and types, monitoring and inspection, and compliance with the manifest system. The proposed rules are open to public review and comment until 16 March 1979, after which time the EPA will work on promulgtion of Final Regulations. Additionally, the EPA must promulgate regulations which require owners and operators to obtain operational permits. Permits will be granted when a proposed facility is judged to be in compliance with the above standards. Permit applications must describe the proposed site and provide estimates of the composition, combinations, quantities, and rates of disposal.

1.465
Subtitle D of the Act contains provisions for States to eliminate open dumps. All sites which are not designated sanitary landfills or facilities for disposal of hazardous waste must be closed or upgraded. Proposed classification criteria for solid waste disposal facilities were published in the Federal Register on 6 February 1978 by the EPA. Administration and enforcement of the above requirements will be accomplished by either State or Federal authorities. Within 18 months of enactment, the EPA must publish guidelines to enable States to develop and administer approved hazardous waste programs. In States where approved programs are not developed and in the interim period prior to plan development (except in States where existing programs are substantially equivalent to the above requirements), the EPA will enforce the above standards and programs.

Ohio Regulations

1.466
Since all land disposal of the project's solid and hazardous wastes would occur in Pennsylvania, the Ohio Regulations pertaining to waste disposal are not relevant.

Pennsylvania Regulations

a) Pennsylvania Solid Waste Management Act (Act 241)

1.467
Pennsylvania's Solid Waste Management Act was passed in August 1968. It is administered by the Pennsylvania Department of Environmental Resources (DER). The purpose of the Act is stated as "providing for the planning and regulation of solid waste storage, collection, transportation, processing and disposal systems; requiring permits for operating processing or disposal systems; and authorizing the Department...to adopt rules, regulations, standards and procedures...." Additionally, the Act establishes the overall prohibition that it is unlawful to "dump or deposit...solid wastes onto the surface of the ground or into the waters of the Commonwealth without...a permit...." To these ends, the Solid Waste Management Rules and Regulations discussed below have been promulgated. These Rules and Regulations contain the operating provisions which would directly regulate the proposed project's solid waste disposal, while the Act provides the authority for such regulations.

b) Pennsylvania Solid Waste Management Rules and Regulations (Title 25, Chapter 75)

1.468
A revised and extended edition of these Regulations became effective 27 June 1977. Administered by the Department of Environmental Resources (DER) they approach regulating solid waste disposal by placing requirements and restrictions on both disposal sites and disposal operations. The primary thrust of the regulations is to prohibit polluting discharges to the land and to any ground and surface waters of the Commonwealth. The Regulations contain several sections which would apply to the proposed project, including a requirement that all solid waste processing and disposal facilities obtain a permit prior to construction and operation. Granting of the permit is contingent upon compliance with planning and operating standards which pertain to all landfills including industrial and hazardous waste disposal sites disposal of sewage sludge, disposal of fly ash, bottom ash and slag, and disposal of construction and demolition debris. The permitting process requires submittal of information in two phases. The first phase information must thoroughly describe the "general operational concept" of the proposed site, including geologic and hydrologic data, anticipated waste sources, types and volumes, and the life expectancy, ultimate disposition and anticipated environment effects of the site. Upon DER approval of this information, second phase information, primarily detailed design plans and specifications, may be submitted for approval.

1.469
The standards which will apply to the proposed project are discussed in the following paragraphs.

Standards for Sanitary Landfills would apply to the disposal areas proposed for the project's hazardous dry, bulky and fine-grained wastes. The standards include requirements pertaining to the following:

- Erosion control, soils drainage, and management of surface water;
- Leachate collection systems and monitoring devices;
- In sites without liners, a ratio of 1:1 of "renovating" soil as (as defined by the DER) to refuse;
- Characteristics and specifications of liners; and,
- General operations, including weight quantification of all received wastes and control of dust.

1.470
Additional Standards for Hazardous Waste Disposal would apply to the proposed disposal sites for the project's hazardous fine-grained wastes (including some potentially hazardous sludges). These standards include requirements for:

- Submittal of soil, geologic and groundwater reports which meet criteria;
- Submittal of information on waste sources, types and volumes anticipated;
- Submittal of a chemical analysis and a leaching analysis (by a DER-approved method) for all wastes;
- Dust control and burning only with DER approval;
- Maintenance of daily operations records; and
- Stabilization and revegetation of completed areas.

1.471
Separate Standards for Fly Ash, Bottom Ash and Slag Disposal areas would also apply to the project. Fly ash and bottom ash would result from combustion of coal in the project's power plant boilers. Although slag from the blast furnace and part of the slag from

steelmaking would be sold rather than recycled, a portion of the steelmaking slag would be aged onsite prior to sale.

1.472
The Standards cover site suitability and stability, surface and groundwater management and site operations. Requirements include:

- Collection of surface runoff and of leachate to prevent erosion and ground water pollution;
- Treatment of collected water and leachate, as necessary;
- Collection and removal from underneath the fill of all soil seeps, springs, and other waters on the site's surface; and
- Restoration and maintenance of the site after completion of operations for as long as necessary to prevent health or pollution hazards.

Finally, during its construction phase, the project would be subject to the Standards for Construction and Demolition Waste Disposal. These Standards require a permit for all such disposal operations. Additionally, they allow for disposal by open burning upon approval of the DER.

1.473
The Standards group construction and demolition wastes into classifications as follows:

Class I - waste material limited to soil, rock, stone, gravel, brick, block, and concrete.

Class II - waste material resulting from land clearing, grubbing, and excavations which may include trees, brush, stumps, other vegetative material, and Class I wastes.

Class III - waste material resulting from the construction or demolition of buildings and other structures which include, but are not limited to wood, plaster, metals, asphaltic substances, Class I and Class II wastes.

Design and operational standards are provided for each classification. Areas which the design standards address include soil suitability, and surface and groundwater protection - including leachate collection and treatment, runoff, erosion and sedimentation control, surface and groundwater monitoring systems, and siting restrictions in relation to 100-year flood levels. Operational standards are also

addressed to surface and groundwater protection as well as to dust control, fire protection, and reclamation prior to abandonment.

County and Local Regulations and Ordinances

a) Erie County Regulation--Disposal of Solid Wastes and Chemicals (pursuant to PL 1304 - Local Health Administration Laws)

1.474
This regulation prohibits in a general way the disposal of solid wastes and chemicals "upon any land...or into any waters of the County...in such a a manner as to be harmful or inimical to the public health, or to animal or aquatic life." Solid wastes listed include constituents of usual household and industrial sanitary wastes as well as metal products, wood or wood products and demolition materials. The subsection addressed to chemicals refers to "chemical substances, chemical wastes, toxic material, and deleterious material of any kind." The Regulation does not further define any of the above terms, nor does it provide criteria, standards, or procedures for determining what disposal actions will be harmful to the public health, or to animal or aquatic life. As such, the Regulation simply provides authority for County regulation of waste disposal while allowing the procedures and standards for determining acceptable disposal to be determined on a case by case basis.

b) Proposed Ordinance of Springfield Township - Sanitary Landfill Areas (Section 611)

1.475
This ordinance requires that all sanitary landfills be located only in the I-2 industrial district, that plans be approved by the Pennsylvania DER, and that the township approve the permit application only when certain local requirements are met. The local requirements are primarily design rather than operations requirements, and include the following:

- A buffer zone of 200 feet from all public rights-of-way and 400 feet from residential structures;
- A 100-foot natural forestry barrier or an 8-foot high solid type fence barrier paralleling all public rights-of-way and adjacent property, to serve as litter prevention and as a visual screen;
- The barrier shall be 200 feet from adjacent property and 75 feet from operations. The 75 feet shall consist of forestry or other natural vegetation;

- A bond shall be filed with the Township Supervisors, sufficient to cover reclamation costs as specified by the DER approved reclamation plan; and

- A restoration plan shall be filed with and approved by the Township Supervisors. The plan must provide for anticipated future use of the site, future topography, roads, drainage and improvements, and soil conservation measures.

c) Proposed Ordinances of Springfield Township - Performance Standards (Section 608)

1.476
The comprehensive scope of this Ordinance provides authority for the township to review any use, land or structure in the township for purposes of determining compliance with certain Performance Standards and to ensure that there will not be caused "any conditions that may be dangerous, injurious, or noxious to any other property or persons in the township." This proposed Ordinance has not been adopted as of this writing. The Performance Standards encompass the areas of air pollution, including ambient quality, visibility, noise and odors, water pollution, erosion, and fire protection. In determining compliance with the Standards, the Board of Supervisors may 1) require a plan of proposed construction and development, including descriptions of machinery and techniques to be used, and 2) obtain expert consultants, at the applicant's expense, to determine conformance of the proposed action with the Standards. Following is a summary of the proposed Performance Standards:

<u>Air Pollution</u>: No pollution of air by fly ash, dust, vapors or other substances shall be permitted which is harmful to health, animals, vegetation or other property.

<u>Smoke</u>: Maximum permissible smoke emission shall not exceed the No. 2 shade of the Standard Ringleman Chart.

<u>Noise</u>: Objectionable noise levels, that is, those in excess of 60 dB at property line, shall be controlled.

<u>Odors</u>: No malodorous gas or matter shall be permitted which is discernible on any adjoining lot or property.

<u>Water Pollution</u>: All waste discharges shall be acceptable to the DER.

<u>Erosion</u>: No wind or water erosion which carries objectionable substances onto neighboring properties shall be permitted.

Fire Protection: When handling or storing flammable or explosive materials, fire protection and fighting equipment acceptable to the Board of Fire Underwriters shall be available.

Land Use Regulations

1.477
Land use would be regulated by several of the Federal and State laws and regulations which apply to the proposed project. Provisions of the Federal Clean Air Act Amendments, Clean Water Act, the Resource Conservation and Recovery Act, and pursuant Federal and State regulations, would affect location of project facilities and related secondary growth. Other State laws and regulations could regulate land use including those pertaining to waste disposal and the regulations which may be promulgated pursuant to the Coastal Zone Management Act to regulate development within the coastal zone. In addition, county and local governments in the project area have a variety of statutes, policies, and plans which can regulate use of land.

Other Relevant Regulations

The Toxic Substances Control Act (TSCA) (PL 94-469)

1.478
The TSCA became effective 1 January 1977. The Act is designed to protect the nation's "health and environment" from "unreasonable risks" from chemical substances and mixtures. It provides authority for EPA regulations of such substances and mixtures prior to manufacturing, distribution in commerce, processing, use, or disposal through premanufacturing notification and testing requirements and subsequent restrictions, as appropriate. Provisions of the Act apply to manufacturers, processors, and distributors of chemical substances. The proposed project may be subject to regulation as a "manufacturer" because it would be manufacturing "chemical substances" as defined in the Act. The project would be subject to the Act's various recordkeeping and reporting requirements as well as to any testing requirements and manufacturing restrictions issued for specific substances. The Act requires the establishment of two separate lists of substances: an Inventory of all chemical substances and mixtures manufactured or processed in the United States since 1 January 1977 (substances manufactured or processed since 1 January 1975, may be included at manufacturers' discretion), and a priority list, not to exceed 50 in number at any one time, of substances and mixtures recommended for immediate testing. The priority list, to be compiled by a special interagency committee, must be evaluated by the EPA and testing requirements must be issued within 12 months for all substances for which testing is deemed necessary. Specific testing

procedures and requirements have not yet been determined but, in general, requirements may include testing for carcinogenesis, mutagenesis, teratogenesis, behavioral disorders and cumulative effects, as well as acute and chronic toxicity and persistence. The interagency committee must review its recommendations and make appropriate revisions every six months.

Endangered Species Regulations

a) The Endangered Species Act of 1973 (PL 93-205)

1.479
In December of 1973, the Endangered Species Act was passed to "provide a program for the conservation of . . . endangered species and threatened species," including conservation of the ecosystems upon which these species depend. The Act was intended to prevent the further decline, and to bring about the restoration of these species and their habitats. The Act is jointly administered by the Departments of Commerce and Interior, with the latter having primary responsibility for the considerations applicable to the proposed Lakefront Plant project site. The Act established definitions of endangered species and threatened species and required that a list of such species be maintained and remain publicly available. Endangered species and threatened species are respectively defined as follows:

> "Endangered...any species which is in danger of extinction throughout all or a significant portion of its range...."

> "Threatened...any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

In addition, the Act provides that regulations may be promulgated to carry out any of its provisions and that State laws may contain equal or greater restrictions than those of the Act.

1.480
Section 7 of the Act, entitled Interagency Cooperation, and the regulations subsequently promulgated to implement Section 7, have primary relevance to the proposed project.

Section 7 states that Federal agencies shall take

> "such action necessary to insure that actions authorized, funded or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species...."

In subsequent regulations, use of the term "critical habitat" was established to identify the habitat essential to the species. This term was defined as habitat "the loss of which would appreciably decrease the likelihood of survival and recovery of a listed species in a distinct segment of the population." A Notice published in the Federal Register on 13 May 1975, stated the intent of the Department of the Interior to establish critical habitats for all listed species. Also stated was that the

> "destruction, disturbance, modification, curtailment, or subjection to human activity of habitat considered 'critical' for a given species would not conform with Section 7 of the...Act"

The Notice emphasized that critical habitats would not be restricted to the habitat necessary to support a minimum species population in that the purpose of the Act includes maintenance of species.

1.481
Regulations published in the on 26 January 1977, set forth procedures to be followed by Federal agencies in carrying out their duties under Section 7. In summary, Federal agencies are to initiate a formal consultation procedure with the Department of the Interior when any action under the Agency's jurisdiction is believed (by the Agency) to have potential effects on listed species. The Department will evaluate the proposed action and render biological advice and assistance which describes the potential effects and recommends a response by the proponent agency. However, the Regulations state that "it is the responsibility of the Federal agency to determine whether to proceed with the activity or program...."

b) Pennsylvania Act Number 331

1.482
This Act, amended in 1974, provides authority to regulate human conduct in relation to fish, aquatic organisms, amphibians and reptiles. Its three main provisions: 1) prohibit the release into any waters of the Commonwealth of any substance deleterious, destructive or poisonous to these organisms, 2) provide authority for rules and regulations governing the taking, catching, killing, and possession of these organisms, and 3) provide authority for separate rules and regulations governing any endangered fish, amphibian, or reptile species--including the taking, catching, killing, and possession of such organisms.

c) Endangered Wild Animals in Ohio--Ohio Revised Code 1531.25

1.483
This law, adopted in 1974, provides authority for rules and regulations governing human conduct in relation to any native animal

species threatened with Statewide extinction and lists endangered species of mammals, birds, reptiles, fish, crustaceans, and mollusks. The Act specifies that the rules and regulations may restrict the taking or possessing of "native species of wild animals, or any eggs or offspring thereof" that are threatened with Statewide extinction. In addition, the rules must establish the list of such endangered species which must include all species listed by the Federal Government pursuant to the Endangered Species Act of 1973. The current Ohio list was established in May 1976.

Noise Control Regulations

a) The Noise Control Act of 1972 (PL 92-574)

1.484
The Noise Control Act of 1972 was promulgated on the Congressional finding that inadequately controlled noise presents a growing danger to the health and welfare of the nation, particularly in urban areas. The Act recognized that while primary responsibility for control of noise rests with State and local governments, Federal action is essential to uniformly regulate major noise sources distributed in commerce. The Act provides the EPA with authority for regulation of new products designated as major sources of noise at their point of entry into commerce, including construction equipment, transportation equipment, any motor or engine, and electrical or electronic equipment. Also included is authorization for regulation of new and existing interstate railroad carriers and motor carriers. Noise emissions standards are to be established for each major source of noise and for the interstate carriers. In addition, the Act authorizes research on the effects, measurement, and control of noise; technical assistance to States and localities to facilitate their enforcement activities; and dissemination of public information on noise effects, acceptable levels, measurement, and control.

1.485
Regulations establishing noise emission standards for each major source of noise at its point of entry into commerce are to be promulgated within 24 months of designation as a major source. Each noise emission standard must reflect the noise level requisite to protect the public health and welfare, taking into account "the magnitude and conditions of use of such product (alone and in combination with other noise standards), the degree of noise reduction achievable through the application of best available technology, and the cost of compliance." Separate noise emission standards for both existing and new rail carriers and motor carriers engaged in interstate commerce are to be promulgated within one year of enactment. These standards also must reflect the degree of noise reduction achievable through application of best available technology,

taking into account the cost of compliance. The sections of these regulations which pertain to existing sources are to be enforced by the Department of Transportation through regulations promulgated by the Department.

1.486
Designated major sources of noise to date include:

- medium and heavy trucks (in excess of 10,000 lbs., gross weight rate),
- portable air compressors,
- truck-mounted garbage compactors,
- wheel and crawler tractors (bulldozers, front end loaders, etc.),
- motorcycles,
- truck-mounted refrigeration units,
- pavement breakers,
- rock drills, and
- power lawn mowers.

Table 1-55 shows for these major sources and for interstate motor and rail carriers the effective dates for regulations establishing noise emission standards, or publication dates of proposed regulations.

b) Ohio Noise Laws

1.487
Ohio has no laws or regulations directly regulating noise emissions, although a section of the Ohio Administrative Code is reserved for noise control statutes.

c) Pennsylvania Motor Vehicle Noise Limitations (PL 58, Section 828, 1959)

1.488
This law sets limitations on motor vehicle operators and manufacturers with respect to the amount of total noise which can be emitted from vehicles under standard test procedures. The limitation on vehicle operators which would apply to the proposed project states

Table 1-55

Designated Major Sources of Noise and Interstate Motor and Rail Carriers: Effective Dates for Standards and Dates of Promulgation

Source	Status of Regulations			Federal Register Publication Date for Proposed Regulations	Effective Date of Promulgated Regulations
	Proposal	Proposed	Promulgated		
Medium and heavy trucks (in excess of 10,000 lb., gwr)			X		1/1/78
Portable air compressors			X		1/1/78 and 7/1/78
Truck Mounted Garbage Compactors		X		8/26/76	
Wheel and Crawler Tractors		X		7/11/77	
Truck Mounted Refrigeration Units					
Pavement Breakers	X				
Rotor Drills	X				
Power Lawn Mowers	X				
Interstate Motor Carriers			X		10/15/75
Interstate Rail Carriers			X		12/31/76

Source: USEPA; Arthur D. Little, Inc.

that "no motor vehicle or combination of vehicles" shall be operated "at any time or under any condition of grade, load, acceleration of deceleration in such a manner as to exceed the following noise... based on a distance of fifty (50) feet from the center of the lane of travel...":

	Speed Limit of 35 mph or less	Speed Limit of more than 35 mph
- Any motor vehicle with a manufacturer's gross vehicle weight rating of 7,000 pounds or more, any combination of vehicles towed by such motor vehicle, and any motorcycle.	90 decibels	92 decibels
- Any other motor vehicle and any combination of vehicles towed by such motor vehicle.	82 decibels	86 decibels

Objects Affecting Navigable Airspace, Part 77 CFR

1.489
These regulations, administered by the Federal Aviation Administration (FAA), establish notification requirements for certain proposed construction projects and standards for determining obstructions in navigable airspace.

Projects for which notification of the Administrator of the FAA is required include those which consist of any construction or alteration that is greater than 200 feet in height above the ground level at its site; or that is of the greater height than imaginary surfaces exceeding outward and upward at one of several specified slopes.

1.490
The FAA must acknowledge the notification in writing with one of the following determinations: the construction would not exceed any stand-ards of subpart C (see below) and would not be a hazard to air navigation; the construction would exceed a standard of subpart C but would not be a hazard to air navigation; the construction would exceed a standard of subpart C and further aeronautical study is necessary to determine whether it would be a hazard to air navigation. The sponsors may request such a study within 30 days. Pending study completion, the construction is presumed to be a hazard to air navigation.

1.491
The standards set forth in subpart C of the regulations for determining obstructions to air navigation provide that an object would be an obstruction "if it is greater in height than any of the following heights or surfaces."

- "...500 feet above ground level at the site of the object."
- "200 feet above ground level or above the established airport elevation whichever is higher, within three nautical miles of the established reference point of an airport... with its longest runway more than 3,200 feet in actual length..." increasing up to 500 feet in the proportion of 100 feet per additional nautical mile; and
- heights within a terminal obstacle clearance area, within an enroute obstacle clearance area, and the surface of a take-off and landing area of an airport or any imaginary surface area specified by the regulations.

State-Owned Submerged Lands (Ohio Revised Code, Section 123.031)

1.492
This section of the Ohio revised code requires that persons desiring to use State-owned submerged lands lease such lands from the State through the Ohio Department of Administrative Services. Lease applications must be accompanied by a deed, title and platte indicating ownership of the adjacent uplands; a resolution from the municipality, port authority or county commissioners approving the applied for use of the submerged lands; and a description of the submerged lands to be occupied prepared by a registered surveyor based on a metes and bounds survey and platte.

Determinations regarding award of leases are based upon satisfactory completion of the above requirements and indication by Federal authorities that the requirements for public rights of navigation, water commerce and fisheries have been met.

CONSULTANTS EMPLOYED DURING THE EVALUATION OF THE APPLICANT'S PROPOSAL

Consultants to the Applicant

1.493
The environmental report submitted to the Corps of Engineers by the United States Steel Corporation in support of their application for a Department of the Army permit was prepared by a number of different consulting firms. The names and addresses of each organization

responsible for the planning, design, and collection of onsite and offsite environmental data follow:

Principal Contractor: Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts 02140

Subcontractors:

Air Quality: Environmental Research & Technology, Inc.
696 Virginia Road
Concord, Massachusetts 01742

Groundwater: Geraghty & Miller, Inc.
Water Research Building
44 Sintsink Drive, East
Port Washington, New York 10050

Soils and Geology: D'Appolonia Consulting Engineers, Inc.
10 Duff Road
Pittsburgh, Pennsylvania 15235

Soils and Geology: Haley & Aldrich, Inc.
238 Main Street
Cambridge, Massachusetts 02142

Ecology: Aquatic Ecology Associates
5100 Centre Avenue
Pittsburgh, Pennsylvania 15232

Fahringer, McCarty, Grey, Inc.
1620 Golden Mile Highway
Monroeville, Pennsylvania 15146

Water Quality: Pennsylvania Environmental Consultants
1517 Woodruff Street
Pittsburgh, Pennsylvania 15220

Dr. Walter J. Weber, Jr.
P.O. Box 7775
Ann Arbor, Michigan 48107

Noise: L. G. Copley, Associates
10 Bowers Street
Newton, Massachusetts 02160

Traffic: Fay, Spofford & Thorndike, Inc.
One Beacon Street
Boston, Massachusetts 02108

Historic Sites and Archeology:	Dr. David S. Brose Curator of Archaelogy The Cleveland Museum of Natural History Wade Oval University Circle Cleveland, Ohio 44106
Steel Technology:	Dr. Bennett Bovarnick, Inc. 41 Brentwood Avenue Newton, Massachusetts 02159
Harbor Modifications:	Hoff-Weston Consultants - Designers 1922 E. 107th Street Cleveland, Ohio 44106

Agency Consultants

1.494
The U.S. Environmental Protection Agency, the Corps of Engineers, and the Commonwealth of Pennsylvania secured the services of several technical consultants during the preparation of this Environmental Impact Statement. A list containing the names and addresses of the technical consultants and brief description of the services rendered is presented below:

U.S. Environmental Protection Agency (Region V)

Dr. Charles Herdendorf Center for Lake Erie Research College of Biological Sciences Ohio State University 484 West 12th Avenue Columbus, Ohio 43210	Critique of the biological monitoring program for Lake Erie in the vicinity of the proposed Lakefront Steel plant site.

U.S. Army Corps of Engineers (Buffalo District)

Dr. Brian J.L.Berry Graduate School of Design Harvard University Cambridge, Massachusetts 01238	Review of the socio-economic data submitted by the Arthur D. Little, Inc., on behalf of U.S. Steel Corporation.
Mr. Alfred V. Papa, Jr. Frye Consultants, Inc. 1818 Market Street Philadelphia, Pennsylvania 19103	Identification and analysis of alternative sites for the proposed Lakefront Steel plant.

Commonwealth of Pennsylvania (Governor's Office)

Dr. Milo Bell, Professor Emeritus University of Washington 211 Fisheries Center Seattle, Washington 98105	Fishery review of the proposed Turkey Creek mitigation plan.

REFERENCES - CHAPTER 1

1-1 Putnam, Hayes and Bartlett. Economics of International Steel Trade: Policy Implications for the United States, an Analysis and Forecast for the American Iron and Steel Institute. Newton, Mass., May 1970.

1-2 Personal Communication, R.F. Haladey, June 9, 1977.

1-3 Lakefront Plant Construction Study.

1-4 Legille, E. and K.H. Peters. "Operation of a Blast Furnace Incorporating a Paul Wurth Bell-less Top Charging System and its Application to Large Blast Furnaces." Ironmaking Proceedings Metall. Society of AIME 32: 144-62, 1973

1-5 "Standard Support and Environmental Impact Statement - An Investigation of the Best System of Emission Reduction for Pushing Operations on By-Product Coke Ovens."

1-6 Dravo Corp. Managing and Disposing of Residues from Environmental Control Facilities in the Steel Industry. April 1, 1977. (EPA-600/26-267)

1-7 Personal Communications with Conrail, Standard Slag Company, and the National Slag Association.

1-8 Geraghty and Miller, Inc. Conceptually Feasible Residuals Disposal Sites - Proposed Greenfield Project, U.S. Steel Corporation. July 1977.

1-9 Haxo, H.E., Jr. Evaluation of Liner Materials Exposed to Leachate. September 1977 (EPA-600/2-76-255)

1-10 Mahloch, J.L. Pollutant Potential of Raw and Chemical Fixed Hazardous Industrial Wastes and Flue Gas Desulfurization Sludges. July 1976. (EPA-600/2-76-182)

1-11 Geraghty and Miller, Inc. Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities. August 1977. (EPA-530/SW-611)

1-12 Personal Communication, R.F. Haladey, June 9, 1977.

1-13 Lakefront Plant Construction Study.

1-14 U.S. Steel Corp. "Plant Layout 5100-0-002," August 24, 1977.

CHAPTER TWO: ENVIRONMENTAL SETTING WITHOUT THE PROJECT

HUMAN ENVIRONMENT

Geographic/Governmental Setting

Geographic Location of Areas Considered

2.1
The derivation of a geographic locale appropriate and meaningful to the development of the human environment baseline and subsequent analysis of environmental impact is based on consideration of the following factors:

- Data relating to economic, demographic, social, and fiscal matters. Such information is generally reported by geopolitical units (communities, counties, States) or economic centers (Standard Metropolitan Statistical Area (SMSA) and Bureau of Economic Analysis (BEA) areas),
- Analysis of permanent and longer-term impacts resulting from the proposed Lakefront Plant and associated development which are related to the facility's operation rather than construction phase,
- Available data and findings from other studies which indicated that the bulk of an operation's workforce resided within a 35-mile radius of the work site. Thus leading to the conclusion that communities within such a zone around the Conneaut Springfield area would likely receive the greatest influx of new residents and their associated impact,
- Discussions with State, county, and local officials indicating that the majority of the workforce employed in the Conneaut Springfield area either resided in these communities or in communities located to east and west along the Lake Erie shoreline. These communities have a more developed infrastructure base and have experienced increases in population partly due to the migration away from urban areas (Erie, Cleveland, Ashtabula).
- That area definitions adopted and impact measures generated must be on a basis that is both meaningful and useful to local, county, and State planners and other officials, and

- The area chosen should not be too large so as to dilute both the absolute and relative impacts generated by the proposed development.

Area definitions based upon SMSA boundaries were reviewed and rejected since the Conneaut-Springfield area does not comprise nor lie within a single SMSA. The Cleveland SMSA lies to the west of Conneaut and includes the counties of Cuyahoga, Geauga, Lake, and Medina, while the Youngstown-Warren SMSA includes only Mahoning and Trumbull Counties. Both of these SMSA units are substantially different from the proposed facility location. Only the Erie SMSA, which comprised all of Erie County, offered a reasonable basis.

2.2
Data collected by the U.S. Department of Commerce and reported on the BEA area basis were also reviewed. On this basis, the Conneaut-Springfield area would be combined with larger geographic reporting units. As a result, the data and forecasts provided by BEA would be based on an area too broad for direct use in this study and by area planners. Moreover, the BEA data and forecasts are quite aggregate and dated, with the latest projections having been produced in 1972. These projections do not incorporate or reflect the 1974-1975 national recessionary period and its impact on area economic parameters. Also, the economy of the area surrounding the Conneaut-Springfield area is quite unlike that portrayed in the BEA areas encompassing and surrounding the facility site. The BEA source would, however, have provided a valuable data source and would have facilitated treatment and analysis of the in/out commutation patterns of area residents. As shown in the publication, The Changing Shape of Metropolitan America,* there has been a marked rise in the movement of populations away from urban areas. The authors have labeled this movement counter-urbanization and have stated that it:

> "...has as its essence decreasing size, decreasing density, and decreasing heterogeneity... is a process of population deconcentration, it implies a movement from a state of more concentration to a state of less concentration."**

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* The Changing Shape of Metropolitan America, Berry and Gillard, Ballinger Publishing Company, Cambridge, Massachusetts, 1977.

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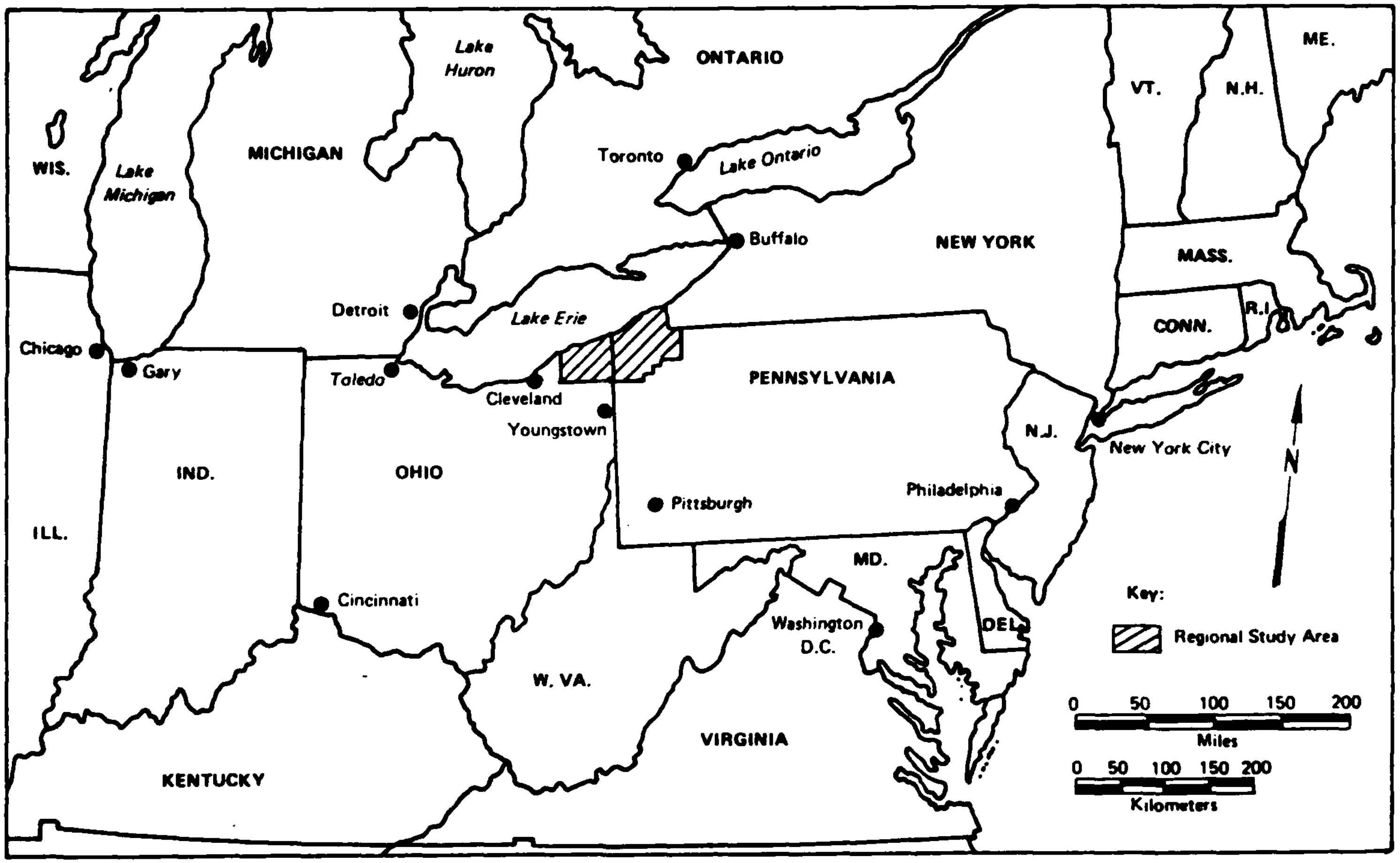

FIGURE 2–1 GEOGRAPHIC LOCATION OF THE REGIONAL STUDY AREA

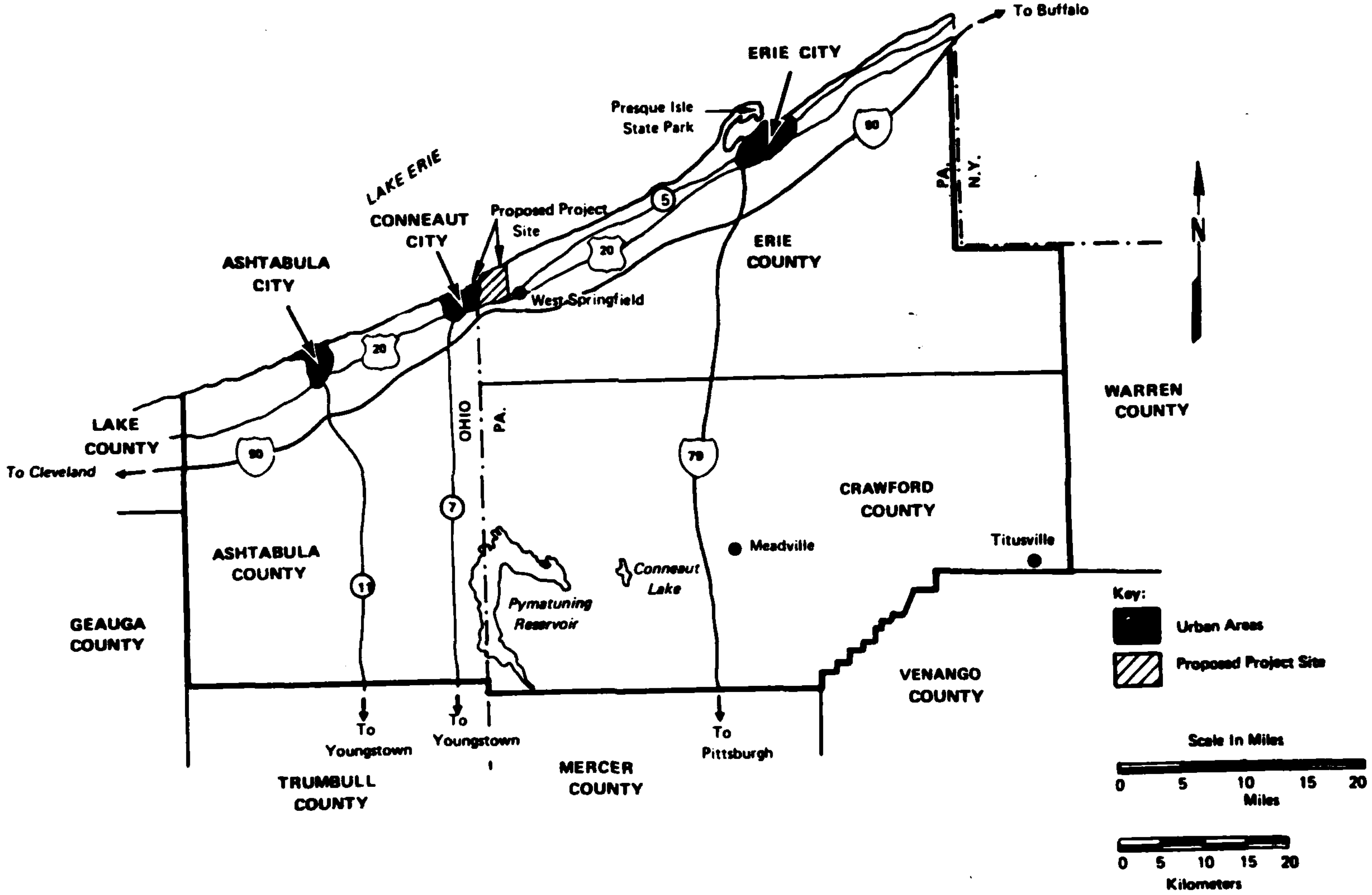

FIGURE 2–2 REGIONAL STUDY AREA AND ADJACENT AREA

Commuter maps were not available for the Conneaut-Springfield area, however, the BEA data did clearly indicate the movement of population out of the urban areas of Cleveland and Erie toward the communities surrounding the Conneaut-Springfield area. In similar fashion, use of the Erie labor market area was rejected since it included several communities quite distant (over 70 miles) from the proposed plant site.

2.3
Based upon the above factors and data sources, two areas were defined and proposed as the basis for the human environment impact analysis. These two areas were labeled the Local Study Area and the Regional Study Area. A subsequent meeting with State, county, and local officials in both Ohio and Pennsylvania led to the inclusion of an area labeled the Principal Study Area. This was proposed by area officials in order to make more of the impact findings directly usable by community planners. Finally, as the analysis proceeded, initial estimates of the likely impact magnitudes derived, and a reassessment of the residential attraction of various communities in the area undertaken, a further breakdown of the Principal Study Area was deemed warranted. This breakdown defined the Coastal Communities. The geographic locale and composition of these four reporting/analysis areas which underlie this part of the impact assessment are given below.

a) Regional Study Area

2.4
The largest area considered over which the proposed facility could significantly affect the economic and social environment is designated the Regional Study Area. The Regional Study Area is located south of Lake Erie, and extends from extreme northeastern Ohio to northwestern Pennsylvania (see Figure 2-1). It is comprised of Erie and Crawford Counties in Pennsylvania and Ashtabula County in Ohio, (see Figure 2-2). The distance from Erie at the eastern end of the study area to Ashtabula City at the western end is about 45 miles. Generally, the area is rural except for three urban centers along the lake. The regional study area is located within a large industrial corridor that extends along Lake Erie from Buffalo, New York, to Detroit, Michigan, and Gary, Indiana, and Chicago, Illinois. The location of the corridor with respect to major urban population centers of the country, excellent access to water, highway, and rail transportation, and proximity to the coal-producing areas in the Appalachian mountains, have contributed to the corridor's industrial development. Ashtabula County is Ohio's largest county, covering 721 square miles. It is bordered by Lake Erie to the north and by the Pennsylvania Counties of Erie and Crawford which also lie within the Regional Study Area. Ashtabula County is primarily rural except for

Ashtabula City and Conneaut, which are the commercial and industrial centers of the county. Erie County provides Pennsylvania's only border on the Great Lakes. It is bordered on the west by Ashtabula County, Ohio, on the south by Crawford County, and on the east by New York State. Erie County is the most urban and industrialized of the three counties in the study area, with its manufacturing activity concentrated in and around the city of Erie. The county itself is a Standard Metropolitan Statistical Area (SMSA) and is the only SMSA in the Regional Study Area. Crawford County is predominantly rural with the cities of Meadville and Titusville as the principal commercial and population centers. The Regional Study Area is traversed by a highway network that connects it to other major urban and manufacturing centers. Interstate Route 90 runs in an east-west direction across the area linking it with Cleveland, Ohio, to the west and Buffalo, New York, to the northeast. Interstate Route 79 crosses the Pennsylvania section of the regional area, connecting Erie City with Pittsburgh, 130 miles to the south. Ohio State Route 7 connects Conneaut, Ohio, with the Youngstown-Warren, Ohio, area about 65 miles to the south. Lake Erie is the dominant physical feature of the regional area, and is important for commerce, recreation, and water supply. The regional study area's access to Lake Erie facilitates trade with other U.S. Great Lakes' ports, Canadian ports, and other foreign ports, via the St. Lawrence Seaway. The Pymatuning Reservoir is another significant geographic feature of the area. The 4,500-acre reservoir is located along the border between Ashtabula County, Ohio, and Crawford County, Pennsylvania, and is a major recreational area. Other important recreation areas include Conneaut Lake in Crawford County, the largest "natural" lake in Pennsylvania, and Presque Isle State Park, a small peninsula extending into Lake Erie from Millcreek Township.

b) Principal Study Area

2.5
The boundary of the Principal Study Area, as defined by Ohio and Pennsylvania officials, runs diagonally from northwest to southwest across Ashtabula County and from northeast to southwest across Erie and Crawford Counties (see Figure 2-3). The city of Erie, Pennsylvania's third largest, is the largest city in both the Principal and Regional Study Areas. Erie is an industrialized urban center, located on Lake Erie about 100 miles from Cleveland to the west and 90 miles from Buffalo to the northeast. Ashtabula City is the major economic and population center of the Ohio portion of the Principal Study Area. The city is located on the shore of Lake Erie and is an important area port. It is the major retail trade center and the site of most industry in the county. The city is 60 miles northeast from Youngstown, Ohio, 55 miles west from Cleveland, and 45 miles east from Erie. Within the Principal Study Area, it is likely

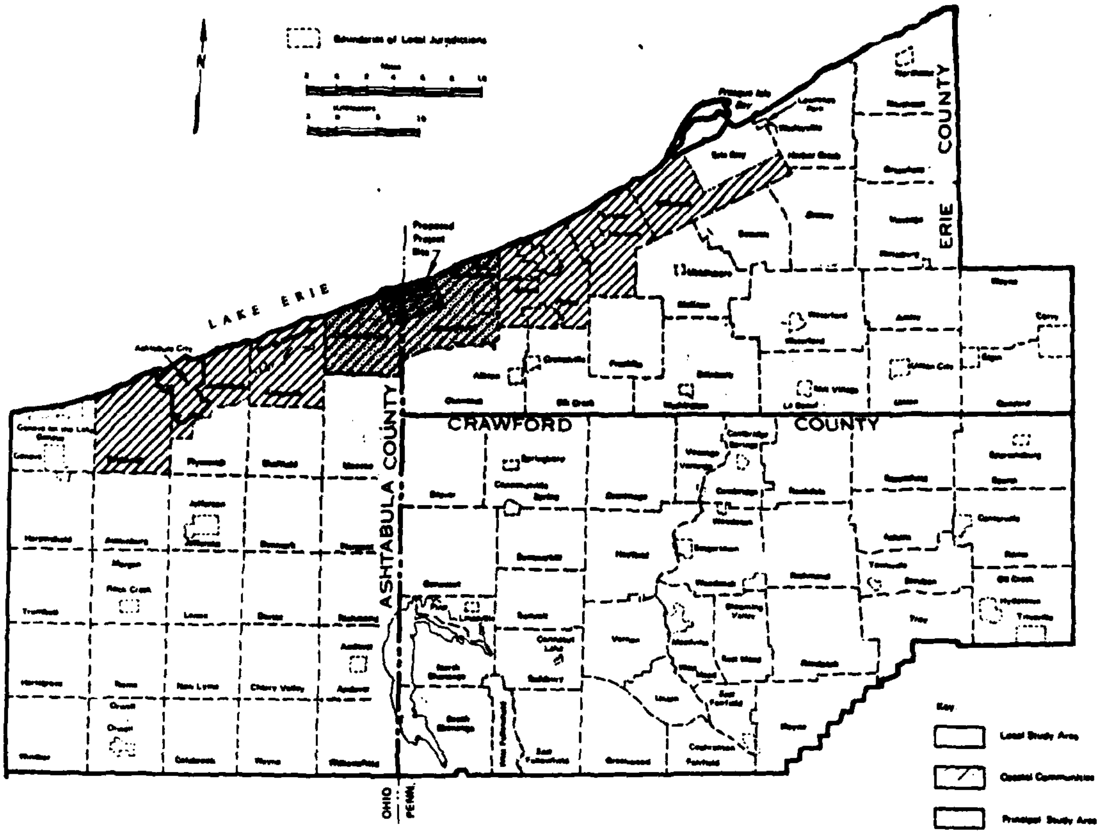

FIGURE 2–3 REGIONAL STUDY AREA

that most of the impact resulting from the proposed Lakefront plant and related development will occur in certain communities. Based on discussions with local county planning offices and the review of data contained in certain applicable independent assessments, the following nine communities, herein called the Coastal Communities, were identified as areas likely to receive a high portion of the secondary economic, demographic, and social impacts (see Figure 2-3):

Conneaut City
Kingsville Township (including North Kingsville Village)
Ashtabula Township
Ashtabula City
Saybrook Township
Springfield Township (including East Springfield Borough)
Girard Township (including Girard, Lake City, and Platea Boroughs)
Fairview Township and Borough
Millcreek Township

Most of the residential and commercial development associated with the proposed facility is likely to occur within these communities. Thus, these areas will also be most affected in terms of population growth and concomitant public facility infrastructure demands (schools, roads, sewers, etc.). This pattern of development is suggested by a combination of the proximity of these areas to the proposed plant, their ease of access to the plant site via the existing highway network, their existing municipal services and social infrastructure, and their less severe winter climate (relative to the southern sections of the Principal Study Area).

c) Local Study Area

2.6
The Local Study Area is comprised of the communities in which the proposed steel mill would be located and represents an area in which significant residential and commercial development associated with the proposed mill could occur. The Local Study Area in Pennsylvania consists of Springfield Township (which includes the unincorporated areas of West Springfield and North Springfield) and East Springfield Borough. This part of the Local Study Area covers 37 square miles and is exclusively rural, sparsely populated, and predominately agricultural. State Route 20 and Interstate 90 connect Springfield with Conneaut and Ashtabula to the west and also provide highway access to Erie to the northeast (see Figure 2-2). The city of Conneaut comprises the Ohio portion of the Local Study Area. Conneaut is located in Northeast Ashtabula County on the shore of Lake Erie and directly to the west of Springfield Township (see Figure 2-3). The city covers approximately 27 square miles--about eight percent of the county's area. Conneaut Creek, which originates in Pennsylvania, runs through the city and empties into Lake Erie, forming Conneaut Harbor. The harbor provides docking facilities for the Port of Conneaut. Conneaut is connected with Ashtabula and Erie

by U.S. Route 20 and Interstate 90, while State Route 7 links the city with Youngstown, Ohio, to the south. Conneaut contains a retail trade area, a slowly growing industrial base, as well as some thickly settled residential areas. It is also the location of the Pittsburgh & Conneaut Dock Company which is one of the largest private coal and iron ore port and shipping facilities in the United States. Conneaut is much less rural and agricultural than Springfield.

Government Structure

a) Levels and Forms of Government in Ohio

Counties

2.7
The organization and powers of county Governments are prescribed by Ohio law and all counties generally have the same form or organization and the same powers. In Ohio, the county is an administrative arm of State Government and exists to carry out certain functions delegated to it under State law. It has no executive head or lawmaking body. Functions delegated to the county by State law include maintenance and construction of roads, public works, public welfare, records and fiscal administration, public safety, and election administration. County administrative responsibilities cover all unincorporated areas of the county and certain designated types of jurisdiction within incorporated areas. In Ashtabula County, one of the principal services provided to unincorporated areas is police protection, which is provided by the County Sheriff. Counties are also responsible for the assessment of all property for taxation by local Governments and school districts. They also play a major role in the finances of local Governments and school districts through review of their operating and capital budgets. The functions delegated to counties under State law are administered by a three-member Board of County Commissioners, elected to staggered four-year terms. It is the policy-making body of the county. Other county officers include a prosecuting attorney, sheriff, coroner, engineer, recorder, auditor, and treasurer--all elected for four-year terms. The Board of County Commissioners appoints several officials including the County Clerk, Director of the Welfare Department, Director of the Planning Commission, Director of Social Services, and Building Inspector. The voters of a county may vote to adopt an alternative form of county Government, which must include either an elected or an appointed county executive. Ohio law also allows for alternative structures with Boards of Commissioners of different size, and for election by district. Few counties have adopted this form. Ashtabula County operates under the conventional three-member Board of Commissioners form. Planning responsibilities for the county are carried out by the Ashtabula County Planning Commission. The Ashtabula County

Airport Authority operates county-wide and supervises operation of the county airport and its facilities. The Authority is directed by a board of trustees. Administration of County parks is the responsibility of the Ashtabula County Metropolitan Park Authority which is composed of three members appointed to the County Probate Court.

Townships

2.8
There are 27 townships in Ashtabula County, of which 13 are located in the Principal Study Area (see Figure 2-4). The functions of township Government and the duties, obligations, and powers of the township trustees are strictly prescribed by State law, and are the same for all. Townships are neither incorporated nor chartered, have no home rule powers, and are considered political subdivisions of State Government. Townships are governed by an elected Board of Township Trustees and a Township Clerk. Trustees are elected for staggered four-year terms. The Trustees and the Clerk serve on a part-time basis. The Trustees are responsible for the administration of services as required by State law, but have no law-making powers. The principal services provided by townships in Ashtabula County include zoning, road construction, maintenance, and repair, fire protection, and cemetery administration.

Municipalities

2.9
Municipal corporations in Ohio are classified as either villages (under 5,000 population) or cities (over 5,000 population). Incorporated municipalities in Ashtabula County include the following (see Figure 2-4):

Cities	Villages
Ashtabula*	Andover*
Conneaut*	Jefferson*
Geneva	Orwell
	Geneva-On-The-Lake
	North Kingsville*
	Rock Creek

Unlike the county and township Governments in Ohio, municipalities can exercise prescribed powers of self-Government through adoption of a home rule charter. They can also adopt police, safety, sanitary, and other ordinances. The State legislature has the exclusive power to prescribe the form of Government for all municipalities which have not adopted a home rule charter. Ashtabula City and Geneva City are the only chartered municipalities in Ashtabula County.

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* In the Principal Study Area

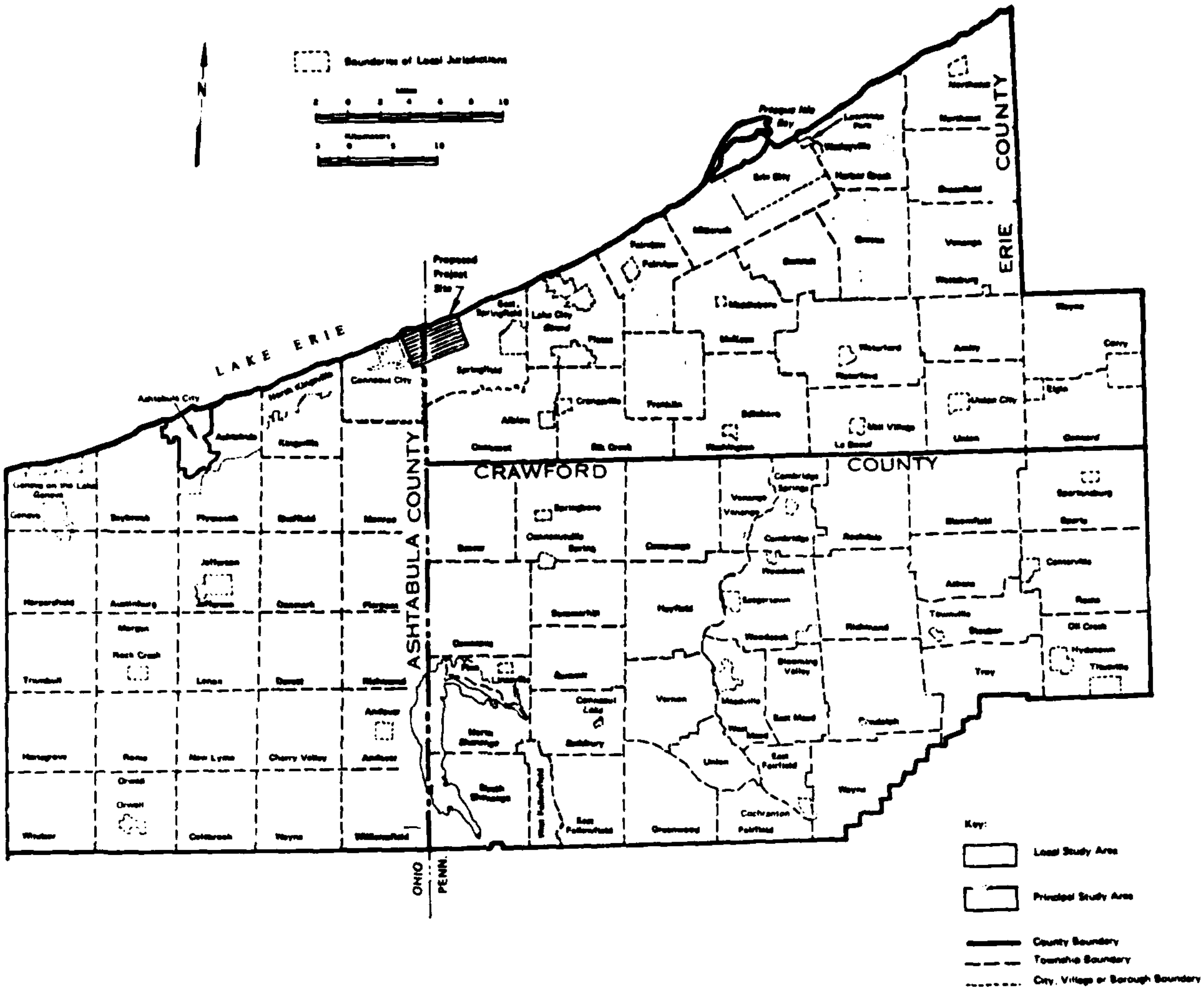

FIGURE 2–4 LOCAL GOVERNMENTS IN THE REGIONAL STUDY AREA

Villages

2.10
The village statutory (i.e., non-chartered) form of Government, which applies to all villages in Ashtabula County, is a combination of the weak mayor-commission form of Government. Legislative authority in villages with a statutory form of Government is vested in a six-member Village Council elected at large for four-year overlapping terms. The Village Council is given both legislative and administrative powers and appoints and removes village employees. The executive power of a village is vested in a Mayor, elected for a four-year term; other village officials include a Clerk and Treasurer, elected for four-year terms, an appointed Marshal, and a Street Commissioner. In addition, the Council may provide by ordinance for other departments or offices which are authorized by law. Villages may create a position of Village Administrator by ordinance. The Village Administrator then serves as the administrative head of village utility and street functions. This individual is given certain purchasing powers and may be given other duties by ordinance. The Village Clerk is elected for four years and is the fiscal officer and record keeper of the village.

Cities

2.11
The statutory city form of Government in Ashtabula County, which applies only to the city of Conneaut, is a mayor-council form with the executive authority split among the mayor and several other elected officials. A mayor is elected every four years. The Conneaut City Council consists of eight members including the President of the Council. Four council members are elected from specific wards with the remaining three being elected on an "at-large" basis. Other elected officials in the city are the City Auditor (who is the City Financial Officer) and City Solicitor (the City Legal Officer), each of whom serves a four-year term; a City Treasurer who serves a two-year term; and the Municipal Judge who serves a six-year term. Under the city plan there is a Department of Public Safety and a Department of Public Service, each administered by a director appointed by the mayor. The Director of Public Safety is the executive head of the police and fire departments, while the Director of Public Service has the responsibility for the management, control, and supervision of all public works, including municipally-owned public utilities. The City Council may also create other offices and departments or commissions authorized under the statutes. Other important bodies in the city include the City Planning Commission whose duties include approving any proposed improvements such as subdivisions, streets, apartments, housing complexes, opening or closing of streets, proposed changes to the Zoning Code, etc. The

Zoning Board of Appeals enforces the Zoning Code and hears appeals on plans which cannot be approved by the Zoning Inspector. The Conneaut Port Authority, which is a financial and administrative entity separate from the city, is responsible for the smooth and complete operation of city-owned lakefront area. It controls the leasing of docks, buildings, etc. Conneaut Township is a separate political entity which exists to administer the township park. The township receives funds from the city and the county.

Chartered Municipalities

2.12
There are three forms of Government used by chartered municipalities in Ohio:

- The strong mayor-council form of Government,
- The weak mayor-council form of Government, and
- The city manager-council form of Government.

Ashtabula City and Geneva City, which have council-manager forms of Government, are the only chartered municipalities in Ashtabula County. Ashtabula is unique among Ohio cities in that the city manager is an elected position. Both the manager and city council are elected for two-year terms. The council is composed of five elected ward councilmen and two councilmen-at-large, one of whom is elected as council president by virtue of receiving the largest number of votes. With the exception of the city solicitor, who is elected, all other department heads are appointed by the manager and confirmed by the council. Important city departments include Police, Fire, Streets and Sanitation, Health, Water Pollution Control (Sewers), Urban Renewal, and the Ashtabula Port Authority. Public housing is administered by the Ashtabula Housing Authority.

School Districts

2.13
School districts in Ohio are separate units of Government with their own political structure and their own taxing and spending powers. School districts often encompass several municipalities and townships; and in some cases a municipality or township may include areas that are in two or more school districts. The governing body of a school district is the elected Board of Education. Ohio law has provisions for creation of new school districts, transfers of territory among school districts and the creation and enlargement of joint vocational school districts. All school districts in Ashtabula County have five members (larger districts elsewhere in the State

have larger boards) elected to four-year staggered terms. The Board appoints the superintendent who is the administrator of the district and develops the budget of the district, subject to review by the county budget commission. The Board of Education for the vocational school district consists of three members of the county school district board, one member from Conneaut, one from Ashtabula, and one from Geneva.

b) Levels and Forms of Government in Pennsylvania

Counties

2.14
The Commonwealth of Pennsylvania classifies each of its 67 counties according to size of population. Erie County is classified as a third-class county (225,000-500,000) while Crawford County is a fourth-class county (150,000-225,000). The organization and powers of county Government in Pennsylvania are regulated by the Pennsylvania Constitution and the County Code. All counties have the same basic organization as provided in the Constitution. However, Act 62 of 1972, the "Home Rule Charter and Optional Plans Law," permits counties to adopt home rule charters and alter their form of Government. Erie and Crawford Counties do not presently operate under home rule charters, so their organization and powers are governed by the County Code. The administrative and legislative functions of county Government for counties without home rule charters are vested in a three-member board of County Commissioners elected to concurrent four-year terms. They direct the financial operations of the county including the establishment of the county tax rate, the assessment of property for county and local tax purposes, the preparation and implementation of the annual budget, and the purchasing of materials and services. The Commissioners are also responsible for providing public services--principally health care, corrections, planning, recreation services, administration of elections, construction and maintenance of public works, and local administration of welfare. Legislation enacted in recent years has strengthened the policy-making role of boards of county commissioners, granting them greater control of and responsibility for county Government. County Commissioners may propose land subdivision and zoning regulations, establish county health services, and undertake urban redevelopment programs. In addition to the three county commissioners, each county elects certain "row officers" who are, to a large extent, independent of the County Commissioners. Crawford County voters elect a Treasurer, Coroner, Recorder of Deeds, Sheriff, District Attorney, two Jury Commissioners, Prothonotary, Clerk of Courts, and three part-time Auditors. The voters of Erie County elect a Controller, Treasurer, Coroner, Recorder of Deeds, Prothonotary, Clerk of Courts, Register of Wills, Sheriff, District Attorney, and two Jury Commissioners. In both counties, a Public Defender is

appointed as provided by law. The elected county officers are enumerated in the State constitution. Their powers and duties, however, are prescribed by provisions of the county codes and State statutes. In November 1976, the Erie County electorate voted to adopt a home rule charter under Act 62 of 1972. The charter will replace the current commission form of Government with an elected council-executive form beginning 1 January 1978. It will become fully operational after a two-year transition period. Under this new form of Government there will be a seven-member council elected to staggered four-year terms. Council members will be elected from separate county election districts, each containing about 40,000 people. The council will be the legislative policy-making body for the county. The executive power will be vested in a single County Executive Officer elected every four years. The latter will appoint a professional administrator who reports directly to the executive officer and is responsible for the day-to-day administration of county services. Except for the Jury Commissioner and the Treasurer, the election and duties of all present row officers will remain when the new charter becomes effective. The duties of the Treasurer will be part of the responsibilities of the Finance Director, while the District Attorney will become a full-time position.

Municipalities

2.15
All municipal Governments have the same basic responsibilities for providing public services at the local level, and all have similar statutory powers. Cities generally have a wider range of specifically enumerated powers than boroughs or townships; however, many of these powers may also be exercised by boroughs and townships under general or specific grants of power. Services provided by municipal Governments include police and fire protection, maintenance and construction of local roads, local utilities such as water and sewage, parking and traffic control, criminal justice, local planning and zoning, parks and recreation, refuse disposal, health and welfare services, civil defense, and libraries. Among the smaller townships --e.g., Springfield, Girard, and Fairview in Erie County--road maintenance and repair is the principal governmental service.

Townships

2.16
There are 57 townships in Erie and Crawford Counties, 23 of which are in the Principal Study Area (see Figure 2-4). Townships in Pennsylvania are classified according to their population density. First-class townships have more than 300 people per square mile, while townships of the second class have less than 300 people per square mile. All townships in Erie and Crawford Counties are second

class, except Lawrence Park in Erie County. Residents not living within a city or borough are under the jurisdiction of township Government. The governing body of townships of the second class is a three-person Board of Supervisors (i.e., Springfield, Fairview, Girard, and Millcreek) elected at large for staggered six-year terms. The Board is the executive and legislative body of the township. Supervisors are generally part-time officials, although in some cases, a supervisor may also be a full-time Roadmaster (road maintenance supervisor) for the township. Townships with more than 3,000 people may have two additional supervisors. The three Township Auditors are also elected. The Board of Supervisors appoints a Secretary/Treasurer, and may also appoint a Solicitor, an Engineer, police officers, special school police, sanitation officers, Park Board, and other such officers and employees as required by the township and allowed by the law.

In Springfield, the township officials include the three Supervisors, three elected Auditors, a Solicitor, and a Tax Collector. The township Government also includes a nine-member Planning Commission, and a three-member Zoning Hearing Board, it retains a Zoning Officer. An engineering form is also retained under contract by the township.

Boroughs

2.17
There are 30 boroughs in Erie and Crawford Counties, 15 of which are in the Principal Study Area (see Figure 2-4). Boroughs in Pennsylvania do not have population-related classifications. The borough Government in Pennsylvania is best described as a weak mayor-council form. It consists of a council which is primarily a legislative body although it does have some executive powers. Individuals serving on the council include a president and several councilmen both of which are elected to four-year overlapping terms. A Mayor is also elected for a four-year term. The powers of the Council are broad and extensive covering virtually the whole range of urban municipal functions. Ordinances and resolutions must be passed by the majority of members voting and must be signed by the Mayor. A Borough Auditor or Controller is also elected while most of the other public officials (Police Chief, Fire Chief, Treasurer, and Solicitor) are appointed by the Borough Council.

Cities

2.18
There are four cities in Erie and Crawford Counties. These are Meadville and Titusville in Crawford County and Erie and Corry in Erie County. Erie is the only Pennsylvania city within the limits of the Principal Study Area. Cities in Pennsylvania are classified

according to their population size. All the cities in Erie and Crawford are classified as third-class cities (10,000-100,000). In 1959, Erie adopted an optional home rule charter that included a strong mayor-council form of Government. The other cities (i.e., Meadville, Titusville, and Corry) have an elected City Manager who is responsible for the administration of city Government.

Planning Commissions

2.19
Thirty-one local Governments in Crawford County and 33 in Erie County have planning and zoning commissions to develop physical plans which future developments may follow. The authority and method by which local Governments undertake planning and zoning activity is detailed in the "Pennsylvania Municipalities Planning Code." In addition to the city, borough, and township planning commissions, there are two county-wide planning commissions to coordinate planning throughout the county. In Crawford County, the commission is known as the Crawford County Planning Commission. The Erie County Metropolitan Planning Department. Erie and Crawford Counties, along with six other counties, are represented by the Northwest Pennsylvania Regional Planning Commission.

Authorities

2.20
There are 18 authorities in Crawford County and 31 authorities in Erie County. Among the major authorities are the Erie Metropolitan Transportation Authority (EMTA), Erie Municipal Airport Authority, Erie County Solid Waste Authority, and the Crawford County Solid Waste Authority. An authority is a special and local corporate unit established under the law for the purpose of acquiring, constructing, maintaining, and operating specified types of public facilities such as buildings, (including school buildings) transportation facilities, marketing and shopping facilities, highways, parkways, airports, parking places, waterworks, sewage treatment plants, playgrounds, hospitals, and industrial development projects and all authorities are financed by means of borrowing money through bond issues. Authority projects must be devoted wholly or partially to public uses. Cost including acquisition, construction, maintenance, and/or operation, and debt service must be met from revenues earned by the projects such as water rates, sewer user charges, and other sales of services, but not from taxes. An authority is established by ordinance by one or more municipalities or local units. The governing bodies of the parent local unit or units appoint the members of the authority's board.

School Districts

2.21
School districts are administered by nine-member school boards elected by the people for six-year overlapping terms. The boards are the controlling and governing agencies for local school districts. As such, they have full power to carry out the responsibilities assigned to the school district by law. They may hire all personnel, provide for school buildings, buy textbooks and supplies, levy taxes, and issue bonds for school purposes. The administrative head of the local school system is the District Superintendent and the school teachers and other personnel are usually recommended by him for appointment by the Board. School districts in Pennsylvania often encompass several municipalities. School districts in Pennsylvania are also classified according to their population size. All the school districts in the Coastal Communities of the Pennsylvania Principal Study Area are classified as third-class (5,000-30,000), except Millcreek, which is classified as second-class (30,000-500,000).

Regional Economic Structure

Civilian Labor Force and Employment

2.22
Estimates of labor force and employment presented in this section are based on place of residence. A discussion of employment by place of residence and place of work is presented later in this section. The latter figures incorporate the effects of dual job holders and inter-area commuters who live outside the Regional Study Area but hold jobs within the Area.

a) Total Regional Study Area

2.23
Data on the levels of the civilian labor force employment, and unemployment in the Regional Study Area are presented in Table 2-1. During the 1960-1975 period, the area's civilian labor force increased approximately 40,000 from 165,000 in 1960 to 205,000 in 1975, with most of the expansion occurring in the early 1970's. During the same period, employment opportunities also expanded significantly. However, the increase in employment was not quite as large as labor force growth since a severe recession hit the area (and the nation) at the end of this period (1975). In both 1960 and 1975, high unemployment rates were experienced in the Regional Study Area - 9.6 percent in 1960 and 9.9 percent in 1975. This compares to national unemployment rates of 5.5 percent and 8.5 percent for the comparable years. The durable goods orientation of the Regional

Table 2-1

Growth in Civilian Labor Force, Employment, and Unemployment in the Regional Study Area(1)

Year	Labor Force	Employment	Unemployment	Unemployment Rate (%)	U.S. Unemployment Rate (%)
1960	165,100	149,300	15,800	9.6%	5.5%
1970	179,700	171,700	8,000	4.5	4.9
1971	183,200	172,400	10,800	5.9	5.9
1972	188,300	178,000	10,300	5.5	5.6
1973	194,900	185,700	9,200	4.7	4.9
1974	202,400	193,400	9,000	4.4	5.6
1975	205,000	184,800	20,200	9.9	8.5
Percent Change					
1960-75	24.2%	23.8%	27.9%		
1960-74	22.6%	29.6%	-43.0%		

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(1) Due to definitional, sampling, and reporting differences, data on this table are not directly comparable with those appearing in later sections.

Source: Ashtabula County, Ohio--1960 and 1970, U.S. Census of Population, General Social and Economic Characteristics, 1975, Ohio Bureau of Employment Services: Erie and Crawford Counties, Pennsylvania, Pennsylvania Bureau of Employment Security.

U.S. unemployment rate from Survey of Current Business, selected years.

Study Area's economy makes it significantly sensitive to national recessionary periods. For the years 1970 through 1973, the rate of unemployment in the Regional Study Area moved essentially with that of the national economy. In 1970, the unemployment rate in the area was 4.5 percent while the national level stood at 4.9 percent. With the downturn in the economy that began in the last part of 1970 deepening throughout most of the first-half of 1971, the unemployment rate increased to 5.9 percent for both the Regional Study Area and the nation. The unemployment rate gradually declined through the latter part of 1971, and all of 1972 and 1973, averaging 4.7 percent and 4.9 percent for the Regional Study Area and the nation, respectively, during this period. For 1974, the annual unemployment rate for the U.S. rose to 5.6 percent and even further to 8.5 percent in 1975 as the nationwide recession set in. Although the national recession did not impact the Regional Study Area until well into 1975, its effects continued well into 1976. As a result, economic activity in the Regional Study Area has lagged behind the national recovery. In 1974, the Regional Study Area unemployment rate declined further from its 1973 level to 4.4 percent, 1.2 percentage points below the rising national level, however, as noted above, it jumped 1.4 percentage points ahead of the national level in 1975. While the Regional Study Area economy is highly sensitive to national business cycles, projections contained in this section represent long-term trends and do not incorporate the effects of future business downturns on the regional economy. To minimize the influence of the national recessionary trends on the implied historical (and future) rate of growth in the Regional Study Area, 1974 was elected as the historical base year. Thus, in many respects, 1974 is a more representative year for the Regional Study Area economy than 1975. Due to the large concentration of economic activity around the city of Erie, the Pennsylvania Regional Study Area has a substantially larger economic base than the Ohio Regional Study Area. In the Pennsylvania Regional Study Area, labor force and employment have consistently represented between 78 percent and 79 percent of the total Regional Study Area. Thus, the size of the economy in the Pennsylvania Regional Study Area is approximately 3.5 times that of its Ohio counterpart.

b) Ohio Study Area

Ohio Local Study Area

2.24
The Ohio Local Study Area is substantially larger than its Pennsylvania counterpart. While a large number of local residents commute outside the immediate area for jobs, Conneaut is essentially a small urban area with sufficient economic activity within its borders to provide some employment opportunities to residents of

surrounding towns. In 1970, the labor force and employment in the city were estimated to be 5,500 and 4,700, respectively, approximately 15 percent of the Ohio Regional Study Area. Since 1970, these levels have not changed materially. During the mid-1960's, Conneaut suffered a tremendous loss in employment due both to the slow growth in the national economy and the closing of the Nickel Plate Railroad. The railroad, which employed over 1,200 residents, was shut down largely by the shift to diesel and away from steam locomotion. Conneaut has been slowly increasing its industrial base since then. In the early 1960's, an industrial park built with Federal funds was opened in Conneaut. Conneaut Rubber and Plastics, which was later absorbed by Norton Company, and EMCO Wheaton, Inc., moved into the park. Over time, additional firms located or expanded their operations in Conneaut to take advantage of its relatively low taxes, rural environment, and stable workforce. Other major industrial employers in the city include General Electric, Premix, Inc., Astatic Corp. and the Pittsburgh & Conneaut Dock Co.

Ohio Principal Study Area

2.25
Ashtabula City is basically the economic center of the Ohio Principal (and Regional) Study Areas. While its population base is more than 60 percent larger than Conneaut, Ashtabula City is still only 60 percent and 20 percent of the size of Millcreek and Erie, Pennsylvania, respectively. The city of Ashtabula does, however, have a number of large industrial employers within its boundaries, including Union Carbide, Reliance Electric Company, RMI Company, and ABS Industries, Inc. Moreover, Ashtabula City is the commercial and service activity center of the Regional Study Area. The labor force residing in Ashtabula City is estimated to be approximately 8,500. The townships of Kingsville, Ashtabula, and Saybrook are fundamentally bedroom communities, similar to those of Girard and Fairview in Pennsylvania. Residents in these communities commute to work primarily in Conneaut, Ashtabula City, and the industrial areas east of Cleveland. The industrial base in these communities is extremely limited in scope and size, with small light industry predominant. Most of its development is the result of the suburbanization and expansion of existing operations located in Ashtabula City. The labor force of these three towns combined is estimated to be approximately 7,000.

Ohio Regional Study Area

2.26
Data on the historical levels of civilian labor force, employment, and unemployment for the Ohio Regional Study Area is presented in Table 2-2. The estimates in the table do not constitute a consistent series, since data for 1960 and 1970 were obtained from the U.S. Bureau of the Census while information for 1971-1975 is from the Ohio

Table 2-2

Resident Labor Force, Employment, and Unemployment in the Ohio Regional Study Area

Year	Labor Force	Employment	Unemployment	Unemployment Rate (%)
1960	35,449	32,228	3,221	9.1%
1970	38,160	36,562	1,598	4.2
1971	40,050	37,200	2,850	7.1
1972	40,600	38,050	2,550	6.3
1973	41,250	39,350	1,900	4.6
1974	42,800	40,925	1,875	4.4
1975	43,175	38,500	4,675	10.8
Percent Change				
1960-75	21.8%	19.5%	45.1%	
1960-74	20.7%	27.0%	-41.8%	

Source: Census of Population, General Social and Economic Characteristics, U.S. Department of Commerce, Bureau of the Census; Ohio Bureau of Employment Services.

Bureau of Employment Services. For example, the Ohio agency estimated the 1970 labor force in the county to be 40,225, approximately five percent larger than the U.S. Census estimate. Based on these two statistical series, the civilian labor force increased approximately 7.5 percent between 1960 and 1970 and an additional 13.1 percent increase during 1970-1975. The more rapid growth in the resident labor force during the 1970's is similar to the experience of the Pennsylvania Regional Study Area. These data also suggest that the unemployment experience in Ashtabula County has run parallel with that occurring in the Pennsylvania Regional Study Area. Since 1970, the data indicate that the unemployment rate in Ashtabula County has on average been only one-half a percentage point higher than the rate in the Pennsylvania Regional Study Area. The level of unemployment in Ashtabula County averaged approximately 2,150 people between 1970 and 1974. Recession more than doubled the county level of unemployment to 4,675 people in 1975, which was 30 percent of the level of unemployment in the Pennsylvania Regional Study Area. Yet, the rate of unemployment in Ashtabula County (10.8 percent) in 1975 exceeded that in the Pennsylvania Regional Study Area.

c) Pennsylvania Study Areas

2.27
The discussion on labor force and employment will proceed from an examination of the local area (i.e., Springfield) to a broader area encompassing the various surrounding townships that delineate the Pennsylvania Principal Study Area, and finally to the total Pennsylvania Regional Study Area. The discussion will focus largely on the larger geographic area because comprehensive and consistent statistics on labor force and employment are available primarily only at the county level. Since the Pennsylvania Local Study Area and many of the surrounding townships are basically bedroom communities of Erie or predominantly rural residential, such a data constraint is not a significant problem in characterizing the economy of the Pennsylvania Regional Study Area.

Pennsylvania Local Study Area

2.28
Springfield Township and East Springfield Borough are small, rural residential communities with very modest economic activity within their boundaries. The resident labor force has grown very little since 1960, and it is estimated by the Pennsylvania Bureau of Employment Security to presently comprise 1,300 people. The majority of the labor force commutes to Erie and Conneaut for its employment.

Pennsylvania Principal Study Area

2.29
The townships and boroughs of Girard and Fairview, like Springfield, are fundamentally bedroom communities. For the most part, the labor force in these two areas looks to the industrial concentration in and around Erie for employment opportunities. However, in recent years, a small industrial base has developed with the boundaries of Fairview Township. Most of the establishments are relatively small in employment size and are the result of either expansion by firms located in the city of Erie or the gradual movement of industry (and population) west to suburban and rural communities. Presently, the labor forces in Girard and Fairview are estimated to be approximately 2,200 and 3,000, respectively. Millcreek Township is a large suburban community bordering the city of Erie to the west. While many of its residents commute to Erie for employment, Millcreek has a substantial amount of economic activity of both a manufacturing and commercial nature within its borders. Among the major employers in Millcreek Township are Erie Manufacturing Company, American Sterilizer Company, Penn Brass & Copper Company, and Presque Isle Plastics, Inc. Currently, the labor force within Millcreek is estimated at 14,000 people.

Pennsylvania Regional Study Area

2.30
The historical levels of labor force, employment, and unemployment in the Regional Study Area are shown in Table 2-3. Since 1960, there has been a substantial increase in resident labor force and employment. The labor force increased 25 percent between 1960 and 1975 with a similar increase in resident employment. An examination of the historical period in five year increments shows that the labor force between 1960 and 1965 increased about 1,500 people, between 1965 and 1970 it escalated by 10,400, and finally between 1970 and 1975, it jumped 20,000 people. In general, employment opportunities kept pace with the growth in the labor force throughout most of the 1960's and early 1970's. Even with a sharp increase in the labor force during the early 1970's, employment kept pace. It appears that the relatively low unemployment rates experienced in the late 1960's and early 1970's helped to induce the sharp growth in the civilian labor force in the early 1970's. By 1975, however, the influence of the national recession caused employment to drop four percent while the labor force continued to increase, thereby substantially increasing the level and rate of unemployment. At the beginning and the end of the 1960-1975 period, high unemployment rates of 9.6 percent or above were experienced in this area. Unemployment levels in all other years ranged between 4.1 percent and 5.6 percent of the labor force, generally in close correspondence with the national

Table 2-3

Resident Labor Force, Employment, and Unemployment in the Pennsylvania Regional Study Area(1)

Year	Labor Force	Employment	Unemployment	Unemployment Rate (%)
1960	129,600	117,100	12,500	9.7%
1965	131,100	125,700	5,400	4.1
1970	141,500	135,100	6,400	4.5
1971	143,200	135,200	8,000	5.6
1972	147,700	140,000	7,700	5.2
1973	153,700	146,400	7,300	4.8
1974	159,600	152,500	7,100	4.5
1975	161,800	146,300	15,500	9.6
Percent Change				
1960-75	24.9%	24.9%	24.0%	
1960-74	23.2%	30.2%	-43.2%	

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(1) A similar table for the Principal Study Area has not been presented because the historical estimates of resident labor force, employment, and unemployment for the Principal Study Area have been estimated at 72% of the regional totals for all years by the Pennsylvania Bureau of Employment Services.

Source: Pennsylvania Total Civilian Labor Force, Unemployment, and Employment, Pennsylvania Bureau of Employment Security.

rate. Since 1975, activity has continued to stagnate in the regional economy. For example, the Erie labor market area (all of Erie County), which represents 75 percent of all economic activity in the Pennsylvania Regional Study Area, continued to have an average unemployment rate of around nine percent for 1976.

Sectoral Employment Trends

a) Total Regional Study Area

2.31
The Regional Study Area experienced above average employment growth throughout the 1960's and early 1970's. Table 2-4 presents the historical levels of employment growth within the Regional Study Area and the United States. During the 1960's, employment opportunities expanded at a rate of 2.1 percent per year in the Regional Study Area, a slightly faster rate than that experienced nationally. The Ohio Regional Study Area grew faster than its Pennsylvania counterpart during the 1960's. From 1970 to 1974, the rate of total employment growth in the Regional Study Area increased from the preceding period, due entirely to the rapid growth rate (3.3 percent per year) in the Pennsylvania Regional Study Area. The Ohio Regional Study Area had a lower growth rate during this period than the national economy (1.8 percent vs. 2.3 percent). The rapid downturn in the economy, which began in the latter part of 1974, had a much larger effect on employment in the Regional Study Area than nationally, primarily because of the area's high dependence upon durable goods production. Nationally, employment declined only 1.3 percent between 1974 and 1975, while the employment decline in the Regional Study Area exceeded 5.5 percent with the Ohio portion experiencing an even higher rate of decline.

2.32
Table 2-5 presents the sectoral breakdown of area employment, both in absolute and percentage terms. In 1974, prior to the recession, manufacturing employment, dominated by the production of durable goods, comprised over 38 percent of Regional Study Area employment compared with less than 25 percent nationally. In contrast to the national economy where, historically, manufacturing sector employment continued to decline as a proportion of total employment, the Regional Study Area had an even higher percentage in the manufacturing sector in 1974 than in 1960 (38.4 percent vs. 37.4 percent). During this period, the employment in the fabricated metals and machinery sector and chemicals/rubber production increased their share of total employment from 16.6 percent to 19.6 percent while the primary metals sector declined in share from 5.0 percent to 3.3 percent. Wholesale/Retail trade accounts for just over 30 percent of non-manufacturing employment and has maintained this share since

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Table 2-4

Growth in Total Employment for the Ohio and Pennsylvania Study Areas and United States

	Average Annual Rate of Growth (%)		
	1960-70	1970-74	1974-75
Total Regional Study Area	2.1%	3.0%	-5.6%
Ohio Regional Study Area	2.4	1.8	-6.2
Pennsylvania Regional Study Area	2.0	3.3	-5.5
United States	1.8	2.3	-1.3

Source: Ohio Department of Employment Services; Pennsylvania Office of Planning and Development; Survey of Current Business, U.S. Department of Commerce, U.S. Bureau of the Census.

Table 2-5

Sectoral Employment in the Regional Study Area
(Thousands)

	1960	1970	1974	1975	Percent Distribution 1960	Percent Distribution 1974
Total	142.1	175.3	197.4	186.0	100.0%	100.0%
Manufacturing	53.1	68.5	75.8	67.9	37.4	38.4
Stone, Clay, Glass	0.5	0.9	1.1	1.1	0.4	0.6
Primary Metals	7.1	7.6	6.6	5.7	5.0	3.3
Fabricated Metals/ Machinery	17.8	23.8	27.7	24.2	12.5	14.0
Other Durables	13.8	18.6	21.7	20.0	9.7	11.0
Chemicals/Rubber	5.8	9.8	11.0	9.8	4.1	5.6
Other Non-Durables	8.1	7.8	7.7	7.1	5.7	3.9
Non-Manufacturing	89.0	106.8	121.6	118.1	62.6	61.6
Wholesale/Retail Trade	27.7	32.2	38.7	36.4	19.5	19.6
F.I.R.E.(1)	4.1	5.3	6.6	6.5	2.9	3.3
Utilities	1.8	2.3	2.2	2.1	1.3	1.1
Communications	2.1	2.4	2.9	2.5	1.5	1.5
Services	21.8	27.0	31.9	32.1	15.3	16.2
Medical Services	5.2	9.0	10.0	9.8	3.7	5.1
Private Education	0.9	2.3	3.4	3.8	0.6	1.7
Selected Services	15.7	15.7	18.5	18.5	11.0	9.4
Government	11.4	17.2	19.3	20.0	8.0	9.8
Transportation Serv.	8.8	7.6	7.0	7.0	6.2	3.5
Construction	4.3	7.6	7.9	6.5	3.0	4.0
Agriculture/Mining	7.0	5.2	5.1	5.0	4.9	2.6

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(1) Finance, Insurance, and Real Estate.

Source: Ohio Department of Employment Services; Pennsylvania Office of Planning and Development.

1960. Sectors in non-manufacturing that have increased their share include services, Government, and construction. Major declines in share occurred in transportation, (from 6.2 percent of total employment in 1960 to 3.5 percent in 1974) and agriculture (from 4.9 percent to 2.6 percent). Examination of the employment increases over this time period clarifies the relative sector growth in the Total Regional Study Area. From 1960 to 1974, there was a 55,000 increase in employment in the Regional Study Area. Employment growth varied substantially among the major sectors for a variety of reasons. Data in Table 2-6 compare the absolute and percentage growths for the important sectors in the Regional Study Area with the national economy. These comparisons demonstrate that the Regional Study Area's manufacturing sectors substantially outperformed the rate of employment growth achieved by the nation from 1960 to 1974. The manufacturing sector, led by fabricated metals/machinery and other durable goods manufacturers, increased total manufacturing employment in the area by approximately 43 percent (22,700). During this period, the area's manufacturing industries benefited from the increasing demands for investment goods, both nationally and locally, which necessitated plant expansion and new hires for many establishments. Additionally, several major chemical producers and plastic fabrication operators moved into the area creating new job opportunities. In other manufacturing industries, primarily non-durables, employment losses were recorded in the Regional Study Area resulting from a fairly low rate of output growth combined with significant gains in labor productivity. The low rate of output growth reflected the geographic reorientation of nondurable goods production to the southeastern part of the United States and away from the older industrial zones of the north -- a trend that was fairly national in scope.

2.33
In the nonmanufacturing sector of the Regional Study Area, employment increased by approximately 37 percent (32,600), slower than the national rate (43 percent). This slower rate in the Regional Study Area resulted primarily from a very moderate growth in total population as well as the area's relatively undeveloped and limited service economy. Within the nonmanufacturing sector, employment growth varied significantly for the following reasons: in agriculture and transportation services, gains in labor productivity have been substantial while production increases have been modest, thereby resulting in large employment declines, in services, trade, and finance, insurance and real estate (F.I.R.E.), increases in demand are primarily a function of population and income growth. Sectors which are more affected by income growth exhibited faster rates of advance than those sensitive primarily to population changes, unlike the other sectors, construction is highly cyclical and point-to-point percentage changes can be very misleading of long-term trends. Wholesale/retail trade employment accounts for the

Table 2-6

Employment Growth in the Regional Study Area and the United States--1960-1974

	Growth in the Regional Study Area Economy		Growth in the U.S. Economy
	Change in Employment (000)	Percent Change	Percent Change
Total	55.3	38.9%	36.8%
Manufacturing	22.7	42.8	19.7
Primary Metals	-0.5	-7.0	9.5
Fabricated Metals and Machinery	9.9	55.6	42.1
Other Durables	7.9	57.2	16.2
Chemicals/Rubber	5.2	89.7	44.4
Other Non-Durables	-0.4	-4.9	4.7
Non-Manufacturing	32.6	36.6	43.0
Wholesale/Retail Trade	11.0	39.7	49.7
F.I.R.E.	2.5	61.0	58.7
Communications	0.8	38.1	42.4
Utilities	0.4	22.2	21.2
Services(1)	10.1	46.3	56.7
Government	7.9	69.3	67.8
Transportation Services	-1.8	-20.4	8.6
Construction	3.6	83.7	37.8
Agriculture/Mining	-1.9	-27.1	-32.2

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(1) Services include private education, medical services, and selected services.

Source: Ohio Department of Employment Services; Pennsylvania Office of Planning and Development
Business Statistics, U.S. Department of Commerce.

majority of nonmanufacturing employment while employment in services as well as F.I.R.E. showed some of the largest percentage increases from 1960 to 1974. Within services, the demand for medical services has risen sharply since the early 1960's stimulated by expanded State and Federal programs, and increased medical coverage offered to employees. Since the labor component in this sector is relatively high and productivity increases have not been significant, employment growth has kept pace with the rise in demand for services. Government employment also experienced rapid growth. Employment increased over 4.0 percent annually during the 1960's, slowing to annual rate of approximately 3.0 percent in the early 1970's. Government employment in the early period surged primarily due to the increase in the number of teachers as a result of rising school enrollments and reductions in pupil/teacher ratios. In addition, the functions of general Government, provided by both local and State agencies, have expanded in recent years, resulting in significant employment growth. Agriculture employment in the Regional Study Area has experienced a decline. The decline is common to this employment sector in most parts of the country in recent decades. For example, in Erie and Crawford Counties, there were 5,360 farms in 1960. By 1970, this number dropped to 4,460 and declined further to 4,090 by 1975. Employment in the transportation services sector, especially in the Ohio Regional Study Area, also exhibited employment declines over the period. Significant advances in automated handling systems were the primary reason for the slow growth nationally in transportation services employment. The Regional Study Area experienced these productivity increases in addition to workforce reductions resulting from the closing of a major railroad maintenance yard in the Ohio Regional Study Area.

b) Ohio Study Areas

Ohio Local Study Area

2.34
The economy of Conneaut, though relatively small, is substantially larger than that of the Pennsylvania Local Study Area. Total employment in Conneaut is over 5,000 representing approximately 15 percent of the Ohio Regional Study Area employment. Table 2-7 presents a historical breakdown of employment for the important sectors of the Conneaut economy. Since 1960, Conneaut has undergone a structural change in its employment base. Conneaut's traditional role as a transportation link for east-west traffic and Lake Erie shipping had provided the primary employment opportunities for area residents. While it is still an important transportation link, employment in transportation services has declined substantially because of the introduction of automated freight handling and significant increases

Table 2-7

Employment in the Ohio Local Study Area

	1960	1970	1974	1975	Percent Change 1960-1974
Total	3,695	4,710	5,145	5,330	39.2%
Manufacturing	1,255	1,840	2,105	2,315	67.7
Fabricated Metals Machinery	700	1,050	1,155	1,265	65.0
Chemicals/Rubber	350	580	480	490	37.1
Other Manufacturing	205	210	470	560	129.0
Non-Manufacturing	2,440	2,870	3,040	3,015	24.6
Transportation Services	1,000	725	600	575	-40.0
Commercial(1)	1,050	1,225	1,275	1,270	21.4
Other(2)	390	920	1,165	1,170	200.0

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(1) Commercial includes wholesale/retail trade, F.I.R.E., and services.

(2) Other includes government, communication, utilities, medical services, private education, agriculture, and construction.

Source: Census of Population, General Social and Economic Characteristics, U.S. Department of Commerce, Bureau of the Census; Ohio Directory of Industries; Arthur D. Little, Inc. estimates.

in productivity in the railroad industry. In 1960, the transportation services sector provided 1,000 jobs, more than 25 percent of the total jobs in the community. Its actual effect on local employment was even greater because of the induced impact on the service sector employees. Since 1960, transportation sector employment has declined by over 400 jobs, and presently comprises less than 12 percent of the total employment in Conneaut. While transportation sector employment declined, expansion in the manufacturing sector has kept Conneaut from stagnating. Manufacturing employment increased by more than 1,000 jobs from 1960 to 1975, with fabricated metals/machinery, molded rubber and plastics, and chemicals providing the growth impetus. Major employers in the city include General Electric, Astatic Corp., EMCO Wheaton, Inc., Webb Manufacturing, Inc., and the Pittsburgh & Conneaut Dock Co. Products of local manufacturers include molded rubber and plastics, sound reproduction equipment, plastic resins, electric lamps, castings, metal cans, windows, and louvers. Growth in the area's employment base has been largely the result of expansions by existing establishments. Presently, two employers in Conneaut are undergoing major expansions --Astatic Corporation and the Pittsburgh & Conneaut Dock Co. An additional 1,000 jobs were also generated in other portions of the nonmanufacturing sector primarily in the Government and construction sectors. However, the commercial sector has not kept pace with growth in other sectors. This may be attributed to the City's low rate of population growth and the fact that a large part of the resident discretionary income is spent in the cities of Ashtabula, Erie, and Cleveland where more extensive shopping facilities are available.

Ohio Principal Study Area

2.35
In the Ohio Principal Study Area, there are approximately 30,000 jobs which represent over 80 percent of the employment in the Ohio Regional Study Area. Economic activity in the Ohio Principal Study Area centers around Ashtabula City, which is approximately twice the population size of Conneaut but greater than four times the size of Conneaut's employment base. Ashtabula City and its environs have enjoyed substantial growth in their manufacturing base, but like Conneaut, have shown a substantial decline in transportation services employment. Historical employment data for the major sectors in the Ohio Principal Study Area are presented in Table 2-8, while Table 2-9 lists the major manufacturing and related facilities in both Conneaut and Ashtabula City/Township. Total employment in the Ohio Principal Study Area increased by 8,700 jobs from 1960 to 1974, an increase of 41 percent. The number of additional jobs generated in the area during the past 15 years is worth noting considering the loss of 1,450 jobs in the transportation services sector and an additional loss of 740 jobs in the agriculture sector. The manufacturing sector led the way in job development as a result of expansion by existing

Table 2-8

Employment in the Ohio Principal Study Area

	1960	1970	1974	1975	Percent Change 1960-1974
Total	21,365	27,965	30,025	27,705	40.5%
Manufacturing	6,875	11,340	12,985	10,935	88.9
Fabricated Metals/ Machinery	2,370	3,600	3,605	3,555	52.1
Metals	1,405	1,325	1,715	950	22.1
Other Durables	915	2,295	2,665	2,125	191.0
Chemicals/Rubber	1,250	3,190	4,190	3,460	235.0
Other Non-Durables	935	930	810	845	-13.4
Non-Manufacturing	14,490	16,625	17,040	16,770	17.6
Transportation Services	3,300	2,175	1,850	1,800	-43.9
Agriculture/Mining	1,330	740	590	560	-55.4
Commercial(1)	6,250	7,600	8,375	8,295	34.0
Other(2)	3,610	6,110	6,225	6,115	72.4

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(1) Commercial includes wholesale/retail trade, F.I.R.E., and services.

(2) Other includes government, communications, utilities, medical services, private education, and construction.

Source: Census of Population, General Social and Economic Characteristics, U.S. Department of Commerce, Bureau of the Census; Ohio Directory of Industries; Arthur D. Little, Inc. estimates

Table 2-9

Major Establishments in the Ohio Principal Study Area

Company	Major Products	1976 Employment
Conneaut		
Pittsburgh & Conneaut Dock Company	Freight handling and shipping	350
General Electric	Lamp bases	450
Astatic Corp.	Sound equipment	400
EMCO Wheaton, Inc.	Liquid handling equipment	350
Webb Manufacturing	Decorative housing material	200
Ashtabula City/Township		
Union Carbide	Ferro alloys, industrial gases and welding wire (2 plants)	1005
Reliance Electric Co.	Electric motors	850
RMI Co.	Sodium reduction, metals extrusion	652
Molded Fiberglas Co.	Plastics	375
ABS Industries, Inc.	Forgings	250
New Jersey Zinc Co.	Titanium dioxide	185
Item Fibre Co.	Miscellaneous plastics	180

Source: Ohio Directory of Industries, 1977.

companies and the attraction of new companies to the area. Total manufacturing sector employment is estimated to have increased by over 6,000 jobs between 1960 and 1974, an increase of 90 percent. The largest increases in employment occurred in the chemicals/rubber sectors (2,940 new jobs) and the other durables sector (1,750 new jobs). Both of these sectors, along with most industrial activity in Ashtabula, were significantly affected by the 1975 recession resulting in total employment losses of over 2,300. Major job losses were experienced in chemicals/rubber, metals, and other durable goods sectors. The economy's strong durable goods orientation makes it very susceptible to swings in the business cycle at the national level. Employment in the non-manufacturing sectors (other than transportation services and agriculture) has exhibited substantial growth, increasing by over 4,700 jobs between 1960 and 1974. The commercial sector in the area over this period grew substantially faster (2.1 percent annual growth) than in Conneaut. Similar to Conneaut, the area also expanded its level of Government employment. Other sectors which exhibited relatively rapid expansion were medical services and private education. Exclusive of the 1975 recession which adversely affected almost all economic activity, the only two industries which had a retarding effect on employment growth over the past 15 years were transportation services and agriculture. Transportation service employment declined dramatically in the area in the early 1960's because of the closing of a railroad maintenance yard and increased worker productivity in this sector resulting in a total loss of 1,450 jobs in the area economy. Agriculture employment losses reflect the closing and consolidation of many farms due to the diseconomies of small-scale farming. Overall, the economic base of the Principal (and Regional) Study Areas is well established in Ashtabula City. Its favorable geographic location, well developed port facilities, extensive transportation network, and experienced labor force have been the major contributing factors in the growth of industrial activity in the city of Ashtabula. Local manufacturers produce a variety of products in the metals, chemicals, rubber, plastics, and equipment sectors. Growth in recent years has been due more to the expansion of present companies than to the relocation of new firms to the area. Presently, the city has embarked on a renewal effort aimed at revitalizing its downtown commercial and retail area.

Ohio Regional Study Area

2.36
Economic activity in the Ohio Regional Study area is substantially smaller in scale than its Pennsylvania counterpart. Ashtabula County, with manufacturing centers in Ashtabula City and Conneaut, has a smaller economic base, but has enjoyed substantial increases in economic activity since 1960.

Table 2-10

Pennsylvania Principal Study Area Employment

	1960	1970	1974	1975	1974 Percent of Total Employed	1960-1974 Percent Change
Total	81,582	101,561	116,135	109,618	100.0%	42.4%
Manufacturing	32,090	41,325	46,546	42,103	40.1	45.0
Stone, Clay & Glass	63	137	176	173	0.2	179.0
Primary Metals	3,271	3,571	2,795	2,742	2.4	-14.6
Fabricated Metals/Machinery	11,469	14,866	17,770	15,014	15.3	54.9
Other Durables	10,018	14,535	17,153	16,371	14.8	71.2
Chemicals/Rubber	2,624	3,738	4,005	3,605	3.4	52.6
Other Non-Durables	4,645	4,478	4,647	4,198	4.0	0.0
Non-Manufacturing	49,492	60,236	69,589	67,515	59.9	40.6
Wholesale/Retail Trade	16,286	18,677	22,510	20,864	19.4	38.2
F.I.R.E.	2,361	3,042	3,875	3,825	3.3	64.1
Utilities	596	703	707	712	0.6	18.6
Communications	1,238	1,407	1,715	1,495	1.5	38.5
Services	13,547	16,129	19,428	19,525	16.7	43.4
Medical Services	3,282	5,628	6,224	6,082	5.4	89.6
Private Education	522	1,153	2,000	2,273	1.7	283.0
Selected Services	9,743	9,348	11,204	11,170	9.6	15.0
Government	6,833	10,342	11,702	12,177	10.1	71.3
Transportation Services	3,537	3,564	3,401	3,411	2.9	-3.8
Construction	2,450	4,473	4,268	3,558	3.7	74.2
Agriculture/Mining	2,644	1,899	1,983	1,948	1.7	-25.0

Source: Pennsylvania Office of State Planning and Development.

Table 2-11

Major Establishments in the Pennsylvania Principal Study Area

Location/Company	Major Products	1976 Estimated Employment
Erie		
Hammermill Paper Co.	Paper products	2.032
Lord Corporation	Fabricated rubber	1,492
National Forge Co.	Iron and steel	1,054
Quaker Oats	Games, toys	1,002
Zurn Industries, Inc.	Valves, fabricated metals (3 plants)	1,731
Bucyrus-Erie	Construction machinery	867
A.O. Smith Corp.	Fluid meters	811
Erie Technological Products	Capacitors	743
Riley Stoker Corp.	Fabricated plates	676
Kaiser Aluminum and Chemical	Aluminum, forgings	579
Erie Malleable Iron	Foundry	569
American Meter Co.	Instruments	501
General Electric	Foundry	456
Millcreek		
American Sterilizer Co.	Surgical supplier	1,550
Eriez Mfg. Co.	Special machinery	269
Penn Brass and Copper Co.	Copper products	200
Presque Isle Plastics, Inc.	Plastics	197
Fairview		
Parker White Metals Co.	Aluminum foundry	580
White Consol. Ind., Inc.	Valves	225
Spectrum Control, Inc.	Electronic capacitors	165
Girard		
Girard Mfg. Co.	Games, toys	777
Copes-Vulcan, Inc.	Blowers and fans	580
Wood Co.	Games, toys	91
Other		
General Electric (Lawrence Park)	Railroad equipment and motors	11,813
Penn-Union Electric Division of Teledyne (Edinboro)	Electrical components	497

Source: 1976 Pennsylvania Industrial Directory, State of Pennsylvania, Department of Commerce.

durables sectors. These sectors have benefited from the nation's increasing demand for such goods and their strategic location in serving the northeast and Great Lakes markets. However, not all manufacturing sectors in the Pennsylvania Principal Study Area shared equally in the increase in economic activity during this period. For example, employment in the non-durables goods industries stagnated between 1960 and 1974 largely because such industries have been relocating and expanding in other parts of the country to serve the faster growing markets of the southwest and southeast. Employment growth in the nonmanufacturing sector was relatively slow during the 1960's, but has since accelerated. The modest advance in the 1960's can be attributed to the associated slow rate of increase in the demand for population-related services as overall population growth in the area slowed due to considerable resident out-migration. Since the late 1960's, out-migration has slowed. With the increased employment opportunities in basic sectors of the economy, the demand for goods and services has strengthened resulting in accelerated growth in the nonmanufacturing sectors. The wholesale/retail trade and services sectors are the largest employers within the non-manufacturing sector and exhibited the greatest absolute increase in employment. In percentage terms, the fastest growing sectors were Government, F.I.R.E., and medical services.

Pennsylvania Regional Study Area

2.39
The Pennsylvania Regional Study Area is highly industrialized with most manufacturing activity centered around Erie and its immediate environs. To a much smaller extent, the Meadville area (in Crawford County) also contributes to manufacturing activity in the Regional Study Area. While the nonmanufacturing sector is more dispersed throughout the area, commercial, financial, and service establishments are concentrated in Erie.

Sectoral Earning Trends

a) Total Regional Study Area

2.40
Total payrolls (in current dollars) more than doubled between 1965 and 1975. Table 2-12 presents data on total payrolls and average wages per worker in the Regional Study Area. Average wages per worker in the Regional Study Area increased approximately 6.3 percent per year between 1965 and 1975 (in current dollars). Since the overall rate of inflation, as measured by the GNP deflator, rose at an average annual rate of 5.5 percent for the 1965-1975 period, real wages in the Regional Study Area increased by less than one percent per year. Within the Regional Study Area, average wages in the *Pennsylvania Regional Study Area have increased* more rapidly than in

Table 2-12

Total Payrolls and Average Wages in the Regional Study Area[1]
(Current Dollars)

	1965		1970		1975		Percent Change 1965-1975	
	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll (Millions)	Average Annual Wages Per Worker
Ohio Regional Study Area	$148.8	$5,510	$ 248.4	$7,150	$ 333.4	$9,540	124.1%	73.1%
Pennsylvania Regional Study Area	592.8	5,100	1,016.9	7,240	$1,481.5	9,770	149.9	91.6
Total Regional Study Area	$741.6	$5,300	$1,265.3	$7,225	$1,814.9	$9,725	144.7	83.5

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[1] Totals exclude government payrolls for all years, since a complete and consistent source was not available for this sector.

Source: Ohio Bureau of Employment Services; and Pennsylvania Department of Commerce, Division of Research and Planning.

the Ohio counterpart. In 1965, wage earners in the Pennsylvania Regional Study Area were paid, on average, seven percent less than those on the Ohio side; by 1975, the average wage in the Pennsylvania Regional Study Area was estimated at two percent above the average in the Ohio Regional Study Area.

b) Ohio Study Areas

Ohio Local Study Area

2.41
Total payrolls in Conneaut are estimated to have been approximately $54 million in 1975, an increase of over 145 percent from the 1965 payroll estimate of $22 million (refer to Table 2-13). In 1975, the Local Study Area accounted for approximately 17 percent of total earnings in the Ohio Regional Study Area, or approximately two percentage points more than its 1965 share. As noted previously, the economic base of the Local Study Area has been in a transition, away from the transportation services sector and toward manufacturing especially the durable goods and fabricated plastics sectors. The success of this shift is evident in examining historical trends. Transportation services payrolls, despite declines in employment, increased $1.6 million from $6.1 million in 1965 to $7.7 million in 1975, an increase of 26 percent. During the same period, total manufacturing wages more than doubled from $9.4 to $25.5 million. Presently, manufacturing wages comprise approximately 46 percent of Conneaut payrolls, while transportation services accounts for slightly over 14 percent, which is well below its 28 percent share in 1965. Although nonmanufacturing sector payrolls comprise more than half of the total, growth in this sector has lagged behind manufacturing. Development of a well-diversified and modern commercial/service sector in Conneaut has not occurred due in part to the lack of population growth, the limited size of its industrial base, and the existence of such activity in nearby communities (e.g., Ashtabula and Erie Cities).

Ohio Principal Study Area

2.42
The Ohio Principal Study Area accounted for approximately 85 percent of total payrolls in the Ohio Regional Study Area in 1975, up slightly from its 1965 share. Total payrolls in the Principal Study Area doubled from $121 million in 1965 to $242 million in 1975. During the same period, average annual wages per worker increased by 68 percent. Data on payrolls and average wages for major sectors of the Principal Study Area is presented in Table 2-14. Similar to the Local Study Area, the primary thrust in payroll growth in the Ohio Principal Study Area during the 1965-1975 period came from the manufacturing sector which contributes approximately 48 percent of total

Table 2-13

Payrolls in the Ohio Local Study Area

	Millions of Dollars		Percent Change (1)
	1965	1975	1965-1975
Total	$21.8	$54.2	124.8%
Manufacturing	9.4	25.2	168.1
Fabricated Metals/ Machinery	4.8	13.4	179.2
Chemicals/Rubber	3.3	5.6	69.7
Other Manufacturing	1.3	6.2	376.9
Non-Manufacturing	12.4	29.0	91.9
Commercial(2)	4.0	7.8	95.0
Other(3)	1.6	5.5	243.7
Government	N/A	5.2	---
Transportation Services	6.1	7.7	26.2
Construction	0.7	2.8	300.0

---

(1) Excludes government payrolls.

(2) Commercial includes wholesale/retail trade, F.I.R.E. and services.

(3) Other includes utilities, communications, private education, and medical services,

NA = Not Available.

Source: Ohio Bureau of Employment Services.

Table 2-14

Payrolls and Average Wages in the Ohio Principal Study Area

	1965		1975		Percent Change 1965-1975[(1)]	
	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll	Average Wages Per Worker
Total	$120.8	$5,560	$269.2	$ 9,730	100.7%	68.0%
Manufacturing	59.7	6,690	121.9	11,100	104.2	65.9
Stone, Clay, and Glass	1.0	6,340	1.4	11,270	40.0	77.8
Primary Metals	8.1	7,280	11.8	12,450	45.7	71.0
Fabricated Metals/Machinery	20.5	6,660	37.8	10,610	84.4	59.3
Other Durables	9.7	7,071	24.0	12,010	147.4	69.8
Chemicals/Rubber	15.4	6,770	39.1	11,330	153.9	67.4
Other Non-Durables	5.0	5,190	7.8	9,610	56.0	85.2
Non-Manufacturing	61.1	4,830	147.3	8,780	97.4	81.8
Wholesale/Retail Trade	15.7	3,800	33.6	6,060	114.0	59.5
F.I.R.E.	3.0	4,840	6.1	7,620	103.3	57.4
Utilities	5.2	8,110	12.2	15,190	134.6	87.3
Communications	1.3	5,040	2.6	8,780	100.0	74.2
Services	8.1	2,880	25.8	8,250	218.5	186.5
Transportation Services	16.9	7,330	23.9	13,290	41.4	81.3
Construction	7.1	7,440	13.0	12,410	83.1	66.8
Agriculture/Mining	3.9	3,870	3.3	5,840	- 15.4	50.9
Government	N/A	N/A	26.7	11,000	--	--

N/A = Not Available.

[(1)] The total percent increase does not reflect government payrolls.

Source: Ohio Bureau of Employment Services.

area payrolls. Manufacturing payrolls more than doubled between 1965 and 1975, with the fastest growth occurring in the chemicals/rubber sector where payrolls jumped over 150 percent for the period. Over the past 10 years, this industry has surpassed fabricated metals/machinery as the manufacturing sector with the largest payroll in the Ohio Principal Study Area. The latter industry increased payrolls by 84 percent from $20.5 million to $37.8 million, while the other durable goods sector also contributed to the area's growth with payrolls increasing almost 150 percent from $9.7 to $24.0 million between 1965 and 1975. The nonmanufacturing sector (excluding Government) increased payrolls by approximately 98 percent from $61 million in 1965 to $120.6 million in 1975. The fastest growing sectors were wholesale/retail (114 percent), selected services (219 percent), utilities (135 percent), and F.I.R.E. (103 percent). The Ashtabula City area has been responsible for most of the growth of the commercial sector. As in the Local Study Area, the transportation services sector, though it has increased its payrolls ($7 million), has seen its relative contribution to the total area payroll decline from 14 percent in 1965 to 10 percent in 1975. The only sector which had an absolute decline in payrolls was agriculture. The contribution of agriculture to the Principal Study Area economy, as in Pennsylvania, was less than two percent of area payrolls in 1975. The relative pattern of average wages in the Ohio Principal Study Area, as expected, is similar to that which exists in its Pennsylvania counterpart. On average, manufacturing sector wages are significantly higher than nonmanufacturing wages. In addition to the fact that average wages in the Ohio Principal Study Area have not risen quite as rapidly as in the Pennsylvania Principal Study Area, there is one major difference in the primary metal area that is worth mentioning. Primary metal workers in the Ohio Principal Study Area, in 1975, earned an average of $12,500 a year versus $17,400 a year in Pennsylvania. The labor skill mix required for the Pennsylvania production is significantly different from that required in the Ohio facilities with the former tending towards higher skill occupational categories. This skill differential is the result of the size of operations of primary metals sector in each of the Principal Study Areas, with the Pennsylvania area being larger and more diverse.

Ohio Regional Study Area

2.43
The relative sectoral distribution of earnings in the Ohio Regional Study Area is fairly similar to that which exists in Pennsylvania with some exceptions. For example, the transportation services sector in Ohio contributes 10 percent to Principal Study Area earnings, while in Pennsylvania the contribution is closer to four percent.

c) Pennsylvania Study Areas

Pennsylvania Local Study Area

2.44
Due to the very small industrial base in the Pennsylvania Local Study Area and the lack of appropriate data, estimates of total payrolls and average earnings per worker were not available. It is likely, however, that average earnings per worker in the few sectors situation within the Local Study Area are comparable to those in the same sectors at the Pennsylvania Principal and Regional Study Area levels.

Pennsylvania Principal Study Area

2.45
In 1975, total payrolls in the Pennsylvania Regional Study Area were almost $1.5 billion, of which approximately $1.1 billion was earned by workers in the Principal Study Area (refer to Table 2-15). The manufacturing sector contributes almost 50 percent of total payroll earnings in the Pennsylvania Principal Study Area. The largest increase since 1965 occurred in the other durables sector where payrolls increased over 150 percent from $86.3 million in 1965 to $222.7 million in 1975. The fabricated metals/machinery sector had the second largest payroll in the manufacturing sector contributing approximately 15 percent of total payroll in 1975. Within the nonmanufacturing sector, selected services and wholesale/retail trade are the largest contributors to the area's total earnings. Earnings in these two sections have increased over 175 percent since 1965. The services sector showed the largest percentage as well as absolute increase during the period, resulting from substantially higher average earnings and total employment in medical and educational services. Earnings in the agriculture sector increased by only 30 percent over the 10-year period. This sector's share of the Pennsylvania Principal Study Area earnings declined from 1.9 percent in 1965 to 1.0 percent by 1975. Similar declines in this sector's relative contribution to total payrolls was evidenced in the Regional Study Area. There is substantial variation among sectors in terms of average wages paid. On the average, manufacturing employees earn approximately 50 percent more than nonmanufacturing employees. Though both major categories of employment have experienced large increases in average payrolls per worker since 1965, the wage gap between manufacturing and nonmanufacturing has narrowed slightly from a 60 percent differential in favor of manufacturing in 1965 to a 49 percent differential in 1975. Within the manufacturing sector, the highest paid employees in the Pennsylvania Principal Study Area are in the primary metals industry (average of $17,410 per year). Their wages are significantly higher than those paid in any other manufacturing industry with the "other durables" category closest

Table 2-15

Payrolls and Average Wages in the Pennsylvania Principal Study Area

	1965		1975		Percent Change 1965-1975	
	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll (Millions)	Average Annual Wages Per Worker	Total Payroll	Average Wages Per Worker
Total	$469.6	$5,124	$1,087.7	$ 9,920	131.6%	93.6%
Manufacturing	251.2	6,544	524.1	12,448	108.6	90.2
Stone, Clay, and Glass	0.2	5,100	2.0	11,660	900.0	128.6
Primary Metals	34.7	9,090	47.7	17,410	37.5	91.5
Fabricated Metals/ Machinery	88.0	6,530	166.1	11,060	88.8	69.4
Other Durables	86.3	6,450	222.7	13,600	158.0	110.8
Chemicals/Rubber	21.1	6,390	39.5	10,950	87.2	71.4
Other Non-Durables	20.9	4,810	46.1	10,980	120.6	128.3
Non-Manufacturing	218.4	4,100	563.6	8,350	158.1	103.7
Wholesale/Retail	64.6	3,910	143.1	6,860	121.5	75.4
F.I.R.E.	13.3	5,460	31.9	8,350	139.8	52.9
Utilities	4.8	6,630	9.0	12,610	87.5	90.2
Communications	6.9	5,980	18.3	12,210	165.2	104.2
Services	41.0	2,791	148.1	7,588	261.2	171.8
Transportation Services	20.5	5,920	39.8	11,670	94.1	97.1
Construction	22.3	6,080	52.5	14,670	135.4	141.3
Agriculture/Mining	8.8	3,870	11.4	5,840	29.5	50.9
Government	36.2	4,350	109.5	8,990	202.5	106.7

Source: Pennsylvania Industrial Census Series 1975, Pennsylvania Department of Commerce; County Business Patterns, U.S. Department of Commerce, Bureau of the Census; Arthur D. Little, Inc. estimates.

with an average earnings per worker of $13,600. Average earnings per worker in the construction, transportation services, communications, and public utilities sectors are well above the level for all nonmanufacturing sector employees in the Pennsylvania Principal Study Area. Typically, the lower paying jobs are in wholesale/retail trade, several components of the service sector, and agriculture. These workers, on average, were making less than $7,000 a year in 1975.

Pennsylvania Regional Study Area

2.46
Total payrolls in the Pennsylvania Principal Study Area represent almost 75 percent of all earnings generated in the Regional Study Area. Thus, the sectoral distribution and other features of payroll earnings in the Regional Study Area closely parallel those described above for the Principal Study Area. This is definitely so in the manufacturing sector which is even more concentrated in the Principal Study Area than in the nonmanufacturing sector which is more dispersed.

Value of Shipments

2.47
Data on value of shipments or sales were not readily available for all economic sectors of the total Regional Study Area. Where necessary, the value of shipments has been estimated from the historical sectoral wage and salary estimates combined with sectoral payroll/shipment coefficients. While value of shipments has been estimated for manufacturing sectors, the comparable measure for nonmanufacturing is value of sales or services. Throughout this discussion, the two measures are often used interchangeably.

a) Total Regional Study Area

2.48
The value of shipments in the Regional Study Area over the 1965-1975 period has more than doubled from approximately $3.2 billion in 1965 to $6.9 billion by 1975, which is equivalent to an annual average rate of increase of 7.8 percent (see Table 2-16). During this period, the general rate of inflation as measured by the GNP deflator was approximately 5.5 percent, thus, in real terms, the value of shipments increased an average of approximately 2.2 percent annually. This rate of growth was slightly below the national average increase of real GNP of 2.7 percent per year during this period. The Regional Study Areas in both States experienced fairly similar rates of growth in shipments. The Pennsylvania Regional Study Area, (which represents over 80 percent of the total Regional Study Area shipments)

Table 2-16

Value of Shipments(1) in the Total Regional Study Area

	Millions of Current Dollars			Percent Change
	1965	1970	1975	1965-1975
Total Regional Study Area	$3,236.9	$4,871.7	$6,896.7	113.1%
Ohio Regional Study Area	$ 623.0	$ 935.4	$1,262.6	102.7
Pennsylvania Regional Study Area	$2,613.9	$3,936.3	$5,634.1	115.5

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(1) Excludes government, private education, and medical services.

Source: Tables 2-18 and 2-22.

increased its total value of shipments from $2.6 billion in 1965 to $5.6 billion by 1975 -- an annual average rate of advance 8.0 percent. Shipments in the Ohio Regional Study Area grew at a somewhat slower annual rate (7.3 percent) during the same period.

b) Ohio Study Areas

Ohio Regional Study Area

2.49
The total value of shipments in the Ohio Regional Study Area has increased from $623 million in 1965 to $1.3 billion in 1975 (refer to Table 2-17), an increase of over 100 percent. Despite this rapid growth, the value of shipments in Ashtabula County represents less than 20 percent of the total produced in the three-county total Regional Study Area.

Ohio Principal Study Area

2.50
As with earnings, the Ohio Principal Study Area comprises approximately 80 percent of the Ohio Regional Study Area shipments, while the Local Study Area comprises 1/6th of the total. Estimates of the value of shipments by sector for the Regional, Principal, and Local Study Areas, respectively, during the period 1965-1975 are presented in Tables 2-18, 2-19, and 2-20. Since the Ohio Principal Study Area accounts for 80 percent of the Ohio Regional Study Area, trends in the value of shipments have been very similar for both areas. In general, growth in the nonmanufacturing sector has exceeded that in manufacturing, with the result that the share of total shipments originating in manufacturing has fallen to about 45 percent. Within manufacturing, growth has been led by chemicals, rubber, and other durable goods. Due to the area's historic orientation toward chemicals/rubber, and fabricated metals/machinery production, these sectors still represent approximately 60 percent of total manufacturing value of shipments. In the nonmanufacturing sector, growth has been led by advances in services, utilities, and communications. However, wholesale and retail trade continues to account for over 50 percent of total nonmanufacturing shipments (sales).

Ohio Local Study Area

2.51
In the Ohio Local Study Area, the overall growth and its composition has been significantly different from the large Principal and Regional Study Areas. Overall, value of shipments in Conneaut jumped 130 percent between 1965-1975, with manufacturing sector growth

Table 2-17

Value of Shipments in Ohio Study Areas

	Millions of Current Dollars			Percent Change
	1965	1970	1975	1965-1975
Regional Study Area	$623.0	$935.5	$1,262.6	102.7%
Principal Study Area	$508.8	$749.3	$1,007.5	98.0
Local Study Area	$ 82.9	$121.7	$ 191.3	130.8

Source: Arthur D. Little, Inc. estimates based on Ohio Bureau of Employment Services; Census of Manufactures, Census of Wholesale/Retail Trade, Census of Selected Services, U.S. Department of Commerce, Bureau of the Census.

Table 2-18

Value of Shipments in the Ohio Regional Study Area

	Millions of Current Dollars			Percent Change
	1965	1970	1975	1965-1975
Total	$623.0	$935.5	$1,262.6	102.7%
Manufacturing	252.5	392.3	492.2	94.9
Stone, Clay, and Glass	3.9	4.8	5.4	38.5
Primary Metals	36.1	49.7	51.5	42.7
Fabricated Metals/ Machinery	75.8	117.9	157.9	108.3
Other Durables	44.5	71.5	86.0	93.3
Chemicals/Rubber	54.1	93.5	132.1	144.2
Other Non-Durables	38.1	55.0	59.3	55.6
Non-Manufacturing	370.5	543.2	770.4	107.9
Wholesale/Retail Trade	174.3	259.9	398.2	128.5
F.I.R.E.	26.6	48.1	58.4	119.5
Utilities	36.1	66.9	85.4	136.6
Communications	4.2	5.9	9.0	114.3
Selected Services	23.9	34.8	57.1	138.9
Construction	26.9	38.3	50.6	88.1
Transportation Serv.	49.5	56.9	73.9	49.3
Agriculture/Mining	29.0	32.4	37.8	30.3

Source: Arthur D. Little, Inc., estimates based on Ohio Bureau of Employment Services; Census of Manufactures; Census of Wholesale/Retail Trade and Census of Selected Services; U.S. Department of Commerce, Bureau of the Census.

Table 2-19

Value of Shipments in the Ohio Principal Study Area

	Millions of Current Dollars			Percent Change
	1965	1970	1975	1965-1975
Total	$508.8	$749.3	$1,007.5	98.0%
Manufacturing	223.9	335.0	441.5	97.2
Stone, Clay, and Glass	3.9	4.8	5.2	33.3
Primary Metals	30.9	39.9	40.8	32.0
Fabricated Metals/ Machinery	70.8	101.0	130.1	83.8
Other Durables	33.4	58.4	82.9	148.2
Chemicals/Rubber	51.4	87.2	130.6	154.1
Other Non-Durables	33.5	43.7	51.9	54.9
Non-Manufacturing	284.9	414.3	566.0	98.7
Wholesale/Retail Trade	142.3	207.0	305.9	115.0
Finance, Insurance, and Real Estate	20.2	35.5	40.6	101.0
Utilities	26.0	49.1	61.2	135.4
Communications	3.0	4.3	6.3	110.0
Services	17.8	25.6	39.7	123.0
Construction	18.6	28.7	34.2	83.9
Transportation Serv.	42.2	48.1	59.8	41.7
Agriculture/Mining	14.8	16.0	18.3	23.7

Source: Arthur D. Little, Inc., estimates based on Ohio Bureau of Employment Services; Census of Manufactures; Census of Wholesale/Retail Trade and Census of Selected Services; U.S. Department of Commerce, Bureau of the Census.

Table 2-20

Value of Shipments in the Ohio Local Study Area

	Millions of Dollars 1965	1970	1975	Percent Change 1965-1975
Total	$82.9	$121.7	$191.3	130.8%
Manufacturing	33.0	52.2	92.8	181.2
Fabricated Metals/ Machinery	16.7	29.5	46.3	177.2
Chemicals/Rubber	11.1	15.9	18.5	66.7
Other Durables	5.2	6.8	28.0	438.5
Non-Manufacturing	49.9	69.5	98.5	97.4
Commercial(1)	29.9	42.2	57.2	91.3
Other(2)	2.9	7.2	14.8	410.3
Transportation Services	15.1	16.0	19.1	26.5
Construction	2.0	4.1	7.4	270.0

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(1) Commercial includes wholesale/retail trade, F.I.R.E., and services.

(2) Other includes utilities and communication.

Source: Arthur D. Little, Inc. estimates based on Ohio Bureau of Employment Services; Census of Manufactures, Census of Wholesale/Retail Trade and Census of Selected Services, U.S. Department of Commerce, Bureau of the Census.

Table 2-21

Value of Shipments in the Pennsylvania Study Areas(1)

	Millions of Current Dollars 1965	1970	1975	Percent Change 1965-1975
Regional Study Area	$2,613.9	$3,936.3	$5,634.1	115.5%
Principal Study Area	1,845.1	2,756.9	3,896.2	111.2

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(1) Comparable data for the Pennsylvania Local Study Area were not available because of its extremely limited economic base.

Source: Pennsylvania Department of Commerce; Census of Manufactures, Census of Wholesale/Retail Trade, Census of Selected Services, U.S. Department of Commerce, Bureau of the Census.

almost twice that of nonmanufacturing. All segments of the manufacturing sector showed strong advances, led by gains in the other manufacturing sector which includes plastic fabrication, lumber products, and selected non-durables. As a result, manufacturing now accounts for almost 50 percent of total value of shipments in the Ohio Local Study Area. On the other hand, growth in nonmanufacturing has been relatively sluggish, reflecting the slow rate of population advance in Conneaut and the existence of more diverse and modern commercial and service centers in the cities of Ashtabula and Erie, coupled with the drawing attraction of Cleveland. The slowest rate of advance was recorded in transportation services -- a trend that has been evident in Conneaut since the mid-1950's.

c) Pennsylvania Study Areas

Pennsylvania Regional and Principal Study Areas

2.52

In current dollars, the Pennsylvania Regional and Principal Study Areas both have shown substantial increases in shipments during the past decade. The historic growth in value of shipments for both areas in Pennsylvania is shown in Table 2-21. Within the Pennsylvania Regional and Principal Study Areas, the value of shipments more than doubled between 1965 and 1975. The share of total Regional Study Area shipments accounted for by firms in the Principal Study Area declined marginally during this time, and is still close to 70 percent. The dominant share of the Principal Study Area reflects the large and diversified industrial base that exists in the city of Erie and the expanding bases in Millcreek and Fairview. Industrial activity in the remainder of the Pennsylvania Regional Study Area is concentrated around Northeast and Meadville. Historical information on the value of shipments by sector in the Pennsylvania Regional and Principal Study Areas are given in Table 2-22 and 2-23. As the data indicates, the overall rate of increase in value of shipments was almost identical. Moreover, the relative performance among the various sectors was also quite similar in both. Such findings are not unexpected since the Pennsylvania Principal Study Area comprises about 70 percent of the total value of shipments in the total Regional Study Area. In general, the faster rates of growth occurred in the nonmanufacturing sectors. For example, the growth in the communication sector out-distanced that of all other industries between 1965 and 1975 in both study areas. Finance, insurance, and real estate activities (F.I.R.E.) also showed substantial advances along with selected services in both areas. These trends are generally consistent with sectoral developments in the national economy. In both study areas, the manufacturing sector accounted for almost 50 percent of total value of shipments. This is a more dominant position than manufacturing has nationally and is an

Table 2-22

Growth in the Value of Shipments in the Pennsylvania Regional Study Area

	Millions of Dollars			Percent Change
	1965	1970	1975	1965-1975
Total	$2,613.9	$3,936.3	$5,634.1	115.5%
Manufacturing	1,279.6	1,849.3	2,591.9	102.6
Stone, Clay, and Glass	3.9	21.0	39.8	923.1
Primary Metals(1)	198.2	260.1	272.4	37.4
Fabricated Metals and Machinery(1)	400.3	615.2	756.4	89.0
Other Durables(1)	343.7	482.0	844.0	145.6
Chemicals/Rubber	123.9	173.6	226.6	82.9
Other Non-Durables	209.6	297.4	452.7	116.0
Non-Manufacturing	1,334.3	2,087.0	3,042.2	128.0
Wholesale/Retail Trade	821.4	1,287.6	1,809.2	120.3
F.I.R.E.	124.0	195.4	295.9	138.6
Utilities	33.4	38.9	60.7	81.7
Communications	23.1	37.5	105.7	357.6
Services	116.2	197.8	320.1	175.5
Transportation Services	71.5	93.2	139.0	94.4
Construction	82.3	160.8	191.0	132.1
Agriculture/Mining	62.4	75.8	120.6	93.3

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(1) Based on state average wage rates for each specific industry; information for the Pennsylvania Regional Study Area not available.

Source: Arthur D. Little, Inc. estimates based on information from Pennsylvania Department of Commerce; Census of Manufacture, Census of Wholesale and Retail Trade, Census of Selected Services, U.S. Department of Commerce, Bureau of the Census.

Table 2-23

Growth in the Value of Shipments in the Pennsylvania Principal Study Area

	Millions of Dollars			Percent Change
	1965	1970	1975	1965-1975
Total	$1,845.1	$2,756.9	$4,042.2	119.1%
Manufacturing	903.1	1,328.8	1,909.2	111.4
Stone, Clay, and Glass	2.8	3.9	7.5	167.9
Primary Metals(1)	89.1	116.9	122.4	37.4
Fabricated Metals and Machinery(1)	303.4	466.1	572.7	88.8
Other Durables(1)	297.7	438.9	767.9	157.9
Chemicals/Rubber	70.5	100.9	131.5	86.5
Other Non-Durables	139.6	202.0	307.2	120.1
Non-Manufacturing	942.0	1,428.1	2,133.0	126.4
Wholesale/Retail Trade	586.8	926.2	1,301.2	121.8
F.I.R.E.	88.6	140.5	212.8	140.2
Utilities	23.9	27.9	44.9	87.9
Communications	16.5	26.9	43.5	163.6
Services	83.2	141.6	229.1	175.4
Transportation Services	51.2	66.8	99.5	94.3
Construction	58.8	115.7	138.2	135.0
Agriculture/Mining	33.0	40.9	63.8	93.3

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(1) Based on state average wage rates for each specific industry; information for the Pennsylvania Principal Study Area not available.

Source: Arthur D. Little, Inc. estimates based on Pennsylvania Department of Commerce; Census of Manufactures, Census of Wholesale and Retail Trade, Census of Selected Services, U.S. Department of Commerce, Bureau of the Census.

indication of the importance of industrial activity in the area. Within the manufacturing sector of the Regional Study Area, the other durables and the fabricated metals/machinery sectors exhibited the largest increases in value of shipments, advancing by more than $400 million and $350 million, respectively. The agriculture/mining sector is relatively small in the two study areas, especially within the Principal Study Area, and its relative share of total area production is declining. Production in this sector, of which agriculture comprises more than 80 percent, is approximately only two percent of total Regional Study Area production and 1.5 percent of total Principal Study Area production.

Occupational Distribution of Resident Labor Force

a) Total Regional Study Area

2.53

The manufacturing strength of the Regional Study Area economy is reflected in the occupational distribution of the resident labor force. According to the 1960 U.S. Census of Population, operatives and craftsmen combined (the two major occupations primarily involved in manufacturing activity) comprised approximately 40 percent of the Regional Study Area resident workforce in 1960, compared to 37 percent in Pennsylvania and only 31 percent nationally. By 1970, the percentage of operatives and craftsmen had increased to 41 percent of the area resident workforce, while in Pennsylvania the ratio declined to 34 percent and the percentage for the U.S. economy remained at 31 percent. A breakdown of the occupational distribution of the resident labor force in the Regional Study Area, the States of Pennsylvania and Ohio, and the total United States for the years 1960 and 1970 is presented in Table 2-24. Another notable difference between the workforce in the Regional Study Area and these other areas is the percentage of laborers in the labor force. While the share of the total labor force classified in this occupational group declined during the 1960's in all areas, the U.S. had a significantly larger proportion of laborers than the Regional Study Area. Despite these differences, the trend in the occupational mix within the Regional Study Area has generally followed State and national trends. Workers in service occupations (e.g., clerical and service) though relatively fewer in the study area have been increasing at rates similar to those of Ohio, Pennsylvania, and the United States. An interesting trend is that administrators and managers comprised a smaller share of the workforce in 1970 than in 1960 in all these areas. This is partially explained by the reduction in farm managers as a result of the decline in the number of farms and the rise in the number of labor force participants in the professional, technical, and kindred occupation categories.

Table 2-24

Occupational Distribution of Resident Labor Force in the Regional Study Area, the States of Ohio and Pennsylvania and the United States--1960 and 1970 (%)

	1960				1970			
Occupations	Regional Study Area	Ohio	Pennsylvania	United States	Regional Study Area	Ohio	Pennsylvania	United States
Professional, Technical and Kindred	10.8%	10.9%	10.2%	11.2%	12.1%	13.2%	13.0%	14.1%
Administrators and Managers	11.0	9.9	8.9	14.7	8.9	8.2	7.4	12.7
Clerical	13.0	14.3	14.1	14.6	15.1	16.3	16.2	17.4
Sales Persons	7.7	7.3	7.5	6.6	6.6	6.8	6.7	6.1
Craftsmen/Foremen	17.0	15.3	15.4	12.8	16.9	14.2	13.9	12.9
Operatives	23.1	20.9	21.6	17.9	23.8	19.8	20.2	17.6
Service Personnel	9.9	10.1	10.6	12.5	11.2	11.1	11.0	12.3
Laborers	7.5	6.0	7.9	9.3	4.4	4.8	5.0	6.4
Not Classified	0.0	5.3	3.6	0.4	1.0	5.6	6.6	0.5

Source: *U.S. Census of Population, Economic and Social Characteristics*, U.S. Department of Commerce, Bureau of the Census.

b) Ohio Regional Study Area

2.54
Comparison between the occupational distribution and trends in the resident workforce of the Ohio Regional Study Area and its Pennsylvania counterpart indicate some notable differences in the distribution among occupations. Table 2-25 presents data on the occupational distribution of the resident workforce in the Ohio Regional Study Area. Overall, the shifts in the relative shares of the various occupations between 1960 and 1970 are similar in both study areas. Occupations which increased their relative standing include professional, technical, and kindred, clerical, and service workers. Declines were recorded in administrators, managers, sales, and laborers. The percentage of operatives in the Ohio Regional Study Area in 1970 was approximately 27 percent of the workforce, compared to 23 percent in the Pennsylvania Regional Study Area. Similarly, the share of laborers was much greater in this study area. These differences in occupational structure between the areas reflect the greater relative orientation of the Ohio Regional Study Area toward selected manufacturing operations. At the same time, lower relative shares were recorded for professional, technical, clerical, and sales occupations in the Ohio area. In Ohio, sales, clerical, and service workers comprise 29.8 percent of the workforce, compared to 33.8 percent in the Pennsylvania Regional Study Area. These differences largely reflect the fact that the Ohio Regional Study Area has yet to develop the same relative level of service and commercial activity as its Pennsylvania counterpart.

c) Pennsylvania Regional Study Area

2.55
The overall occupational distribution of resident employment in the Pennsylvania Regional Study Area is, of course, quite similar to that of the total Regional Study Area (refer to Table 2-26).

Cost-Of-Living In the Regional Study Area

2.56
Data on the cost-of-living for the specific Ohio and Pennsylvania Regional Study Areas or for any of its components are not collected by Government agencies. Consumer price information is available, however, for a number of municipalities in various population ranges in close geographic proximity to the total Regional Study Area. The cost-of-living in cities in the United States increased substantially from 1970-1975 (refer to Table 2-27). In fact, living costs increased more from 1970-1975 (38.6 percent) than during the entire 1960's (31.3 percent). Costs for food, home ownership, and medical care were the primary contributors to the rapid increase in the overall Consumer Price Index (CPI) for the United States.

Table 2-25

Occupations in the Ohio Regional Study Area-- 1960 and 1970

	1960		1970	
Occupations	No. of Employees	Percent	No. of Employees	Percent
Professional, Technical and Kindred	2,465	8.0%	3,680	10.1%
Administrators and Managers	3,710	12.1	3,570	9.8
Clericals	3,320	10.8	4,645	12.7
Salespersons	2,035	6.6	2,155	5.9
Craftsmen/Foremen	5,460	17.8	6,225	17.0
Operatives	7,865	25.6	9,975	27.3
Service Personnel	2,900	9.5	4,080	11.2
Laborers	2,945	9.6	2,230	6.0
Total	30,700	100.0%	36,560	100.0%

Source: U.S. Census of Population, Social and Economic Characteristics, U.S. Department of Commerce, Bureau of the Census.

Table 2-26

Occupations in the Pennsylvania Regional Study Area--1960 and 1970

Occupations	1960 No. of Employees	1960 Percent	1970 No. of Employees	1970 Percent
Professional, Technical and Kindred	13,465	11.5%	17,025	12.6%
Administrators and Managers	12,530	10.7	11,755	8.7
Clericals	15,925	13.6	21,210	15.7
Salespersons	9,370	8.0	9,185	6.8
Craftsmen/Foremen	19,675	16.8	22,830	16.9
Operatives	26,345	22.5	30,805	22.8
Service Personnel	11,710	10.0	15,265	11.3
Laborers	8,080	6.9	5,270	3.9
Not Classified	-0-	0.0	1,755	1.3
Total	117,100	100.0%	135,100	100.0%

Source: U.S. Census of Population, Social and Economic Characteristics, U.S. Department of Commerce, Bureau of the Census.

Table 2-27

U.S. Consumer Price Index, City Average
(1970 = 100)

	1960	1965	1970	1975
All Items	76.2	81.3	100.0	138.6
Food	76.6	82.2	100.0	152.7
Rent	83.3	87.1	100.0	124.7
Home Ownership	67.2	70.7	100.0	141.4
Transportation	79.5	85.1	100.0	133.6
Medical Care	65.6	74.2	100.0	139.8

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Table 2-28

Comparative Cost of Living(1)
(U.S. = 100)

	Buffalo		Pittsburgh		Cleveland	
	1970	1975	1970	1975	1970	1975
All Items	106	105	97	95	105	103
Food	106	102	103	103	101	99
Rent	104(2)	102	102(2)	103	98(2)	99
Home Ownership	105(2)	105	84(2)	83	91(2)	88
Transportation	110	108	100	98	102	102
Medical	91	86	87	87	99	98

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(1) Based on an intermediate budget for a four-person family.

(2) Data are for 1972.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

2.57
Comparative (relative to that of the United States) living cost indices for Buffalo, Pittsburgh, and Cleveland, three metropolitan areas close to the Regional Study Area are presented in Table 2-28. As the data indicate, the relative cost-of-living varies significantly among the cities. For example, whereas the overall cost-of-living in Buffalo and Cleveland are relatively similar, living costs in Pittsburgh are approximately 10 percent less. The cost of selected budget items also varies among the cities. For example, Buffalo relative to the other cities, on the average, exhibits the most expensive cost pattern although it exhibited the least expensive costs for medical care. The largest cost differences between the cities are for home ownership. It is approximately 25 percent more expensive to own a home in the Buffalo area than to own a similar home in Pittsburgh. Even though, for the most part, the overall cost-of-living and the cost for selected components varies from city to city, the data indicate that the rate of price increases among the cities for the 1970-1975 period was essentially the same. During this period, the overall national CPI rose approximately 40 percent, however, the comparative cost indices for these cities relative to the U.S. average in 1975 were only marginally lower than the 1970 comparison. While there are cost differences among the large cities surrounding the Regional Study Area, the residents of these three cities are experiencing similar inflationary pressures on their household budgets. Although these statistics are not directly applicable to the Regional Study Area because its major urban centers are significantly smaller than any of these three cities, and the rest of the Regional Study Area is fairly rural, trends in living costs are likely to be very similar.

2.58
To provide another set of indicators for comparative purposes, cost-of-living indices of representative small and large urban communities throughout the nation were examined (refer to Table 2-29). The data do not reflect comparative costs between the areas, only the changes in prices in an area over time. It is apparent from the data that the recent inflationary pressures in the United States have affected all communities in a similar manner. The cost of living in both large and small urban areas has risen by over 60 percent since 1967. There are some differences in the rates of increase in selected expenditures between the large and small urban areas, but these differences are less than five percent over the eight-year period. While the data presented above are not totally conclusive, they do suggest strongly that inflation in the Regional Study Area can be expected, on average, to parallel the U.S. average. There may be variations in the rate of increase with respect to the various components of the cost-of-living. However, for purposes of this analysis, it has been assumed that the rate of inflation in the Regional Study Area will parallel that at the national level.

Table 2-29

Consumer Price Index for Urban Wage Earners

(1967 = 100)

	Large Urban (1)		Small Urban (2)	
	1967	1975	1967	1975
All Items	100.0	162.5	100.0	161.3
Food	100.0	176.4	100.0	174.4
Housing	100.0	166.8	100.0	169.1
Apparel and Upkeep	100.0	139.2	100.0	143.3
Transportation	100.0	155.9	100.0	148.1
Health and Recreation	100.0	156.3	100.0	151.2

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(1) Large Urban includes population areas of 3.5 million or more (e.g., Chicago, Los Angeles, New York).

(2) Small Urban includes population areas of 2,500 to 50,000 (e.g., Findlay, Ohio; Millville, New Jersey; Kingston, New York).

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Projections of Baseline Economic Activity

a) Methodology

2.59
Projections of economic activity in the total Regional Study Area through 1990 have been derived as an aggregation of projections for the corresponding study areas in each of the two States. In general, the approach to deriving the projections is based upon an analysis and assessment of comparative trends in employment. Projections of employment are then used as the basis for deriving estimates of all other economic indicators (such as occupational distribution and payroll earnings of the labor force and the value of shipments). Overall, total employment, labor force, and population were projected based largely upon State and national comparative trends and projections. These projections were prepared for each of the State study areas independently and then aggregated to obtain projections of the total Regional Study Area. The projections of macro employment indicators were conditioned by assumptions made regarding population migration, labor force availability, participation rates, and economic opportunities available in the Regional Study Area economy. At the same time, projections of employment were prepared for individual industry sectors based on a similar comparative analysis and assessment of State and national trends relative to the Regional Study Area and its major geographic components. The projections obtained via this "bottom-up" approach were aggregated and compared with those derived from the "top-down" approach which focused largely on macro employment indicators. Differences in the projections resulting from these two approaches were quite small, requiring little adjustment to reconcile and yield a consistent set of estimates through 1990. Throughout this exercise, information describing the historical trends in the total Regional Study Area and its major geographic components was reviewed along with data provided by various State, county, and local officials. The State of Pennsylvania through the Office of State Planning and Development (OSPD) provided detailed economic projections of the State and the Pennsylvania Regional and Principal Study Areas for the years 1980, 1985, and 1990. With minor modifications, its projections have been used through the year 1980. For the 1980-1990 period, more extensive modifications were made in association with OSPD staff to better reflect and balance expected growth in population, labor force, and sectoral production. For the study areas within Ohio, estimates were made based primarily on assessments of historical trends.

Employment

2.60
The methodology used for projecting nonmanufacturing employment in the Ohio and total employment in the Pennsylvania Study Areas is

fundamentally trend analysis. The relatively small manufacturing base of the Ohio Regional Study Area required the use of a different projection methodology than that for Pennsylvania and is discussed later on in this section. The historical trends in employment growth and employment/population ratios for the service sector of the study areas were compared to that of the States of Pennsylvania and Ohio and the nation to gain an understanding of the area's relative strength and potential for future development. Economic projections of the area, State, and nation made by State and Federal agencies were also examined to derive employment (and population) projections.

2.61
Historical and projected growth rates for population, manufacturing, and nonmanufacturing employment for the Ohio and Pennsylvania Study Areas, the State of Pennsylvania, and the nation are presented in Table 2-30. There are two sets of projected data for the 1980-1990 period. One set represents the projections made by national and State agencies, the other set represents projections used in this analysis, (derived in conjunction with State and local agencies in the Regional Study Area). As noted, the State of Pennsylvania's projections were prepared by OSPD, while those for the total nation were prepared by the U.S. Water Resources Council in association with the U.S. Department of Commerce, Bureau of Economic Analysis and the Census, as part of its OBERS projections (2-1) of economic activity in the United States. There are two important points concerning national projections which should be noted. First, the 1972 OBERS projections were made assuming an annual population growth rate for the nation for the 1980's of 1.0 percent which resulted in an annual rate of increase in nonmanufacturing employment of 1.2 percent. More recent population projections prepared by the U.S. Bureau of the Census assume a lower level of fertility, resulting in an annual population growth rate during the 1980's of 0.7 percent. (2-2) Since the OBERS projections of nonmanufacturing market demand are highly dependent on population, growth in nonmanufacturing employment nationally has been revised to 0.9 percent per annum which is more consistent with the revised population growth. Second, projections of population growth in Pennsylvania prepared by the U.S. Bureau of Census show an average gain of approximately 0.3 percent annually in the 1980's. This projection assumes continued out-migration of population in the State. Initial population projections for the State of Pennsylvania prepared by OSPD were based on an assumption of a significant decline in the historical level of net out-migration and resulted in an annual growth rate of 0.8 percent during the 1980-1990 period. Following discussions with State officials concerning their preliminary population projections, the national forecast of population growth prepared by the Bureau of the Census for the State of Pennsylvania was adopted for this analysis.

Table 2-30

Average Annual Growth Rates of Population and Employment

	Actual		State & Federal Projections(1)		Modified Baseline Projections
Population	1960-70	1970-74	1974-80	1980-90	1980-90
Ohio Regional Study Area	0.5%	0.7%	N/A	N/A	0.5%
Pennsylvania Regional Study Area	0.5	0.7	0.6%	1.0%	0.7
State of Pennsylvania	0.4	0.1	0.3	0.8	0.3
United States	1.3	0.9	0.8	1.0	0.7
Manufacturing Employment					
Ohio Regional Study Area	5.1%	1.9%	N/A	N/A	0.7%
Pennsylvania Regional Study Area	2.1	2.8	0.2%	1.4%	0.9
State of Pennsylvania	0.3	-1.0	0.2	0.8	0.3
United States	1.4	0.7	1.1(2)	0.5	0.5
Non-Manufacturing Employment					
Ohio Regional Study Area	1.1%	1.8%	N/A	N/A	1.4%(3)
Pennsylvania Regional Study Area	2.0	3.7	0.9%	1.7	1.2
State of Pennsylvania	1.4	2.2	0.6	1.0	0.6
United States	2.1	3.1	2.2(2)	1.2	0.9

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(1) State and area projections are preliminary projections made by the Pennsylvania Office of State Planning and Development. The United States projections are from the OBERS series.

(2) 1970-80 annual growth rate; OBERS projections do not reflect the 1975 national recession.

(3) 1974-90 average annual growth rate.

N/A = Not Available.

Source: Pennsylvania Office of State Planning and Development; U.S. Bureau of the Census; 1972 OBERS Projections (Series E Population), U.S. Water Resource Council; Arthur D. Little, Inc. estimates.

2.62
Projections of total population, manufacturing, and nonmanufacturing employment in Pennsylvania and the Regional and Principal Study Areas were based on a comprehensive assessment of historical trends and relationships with national levels. Modified baseline projections of these indicators were prepared for the 1980-1990 period as shown in Table 2-30. The employment projections reflect the following growth relationships:

1. Manufacturing employment in the Pennsylvania Regional Study Area will continue to outperform the nation and the State with most of the growth occurring in the Principal Study Area, thereby continuing the historical trend. However, growth will be much slower than that experienced during the 1960-1974 period.

2. Nonmanufacturing employment growth in the Pennsylvania Regional Study Area will continue to outpace the nation, despite similar population growth projections. The Regional Study Area's employment/population ratios for nonmanufacturing activity are presently below national averages. Since the 1960's, the differential in the ratios between the nation and the Regional Study Area has been narrowing; this trend has been projected to continue through 1990.

3. Nonmanufacturing employment growth in the Ohio Regional and Principal Study Areas is projected to increase more rapidly than in Pennsylvania despite a projected slower growth in population. This reflects the following considerations: first, historical growth in this major sector is significantly distorted because of the large employment declines in transportation services; second, the Regional Study Area has much catching up to do with respect to providing services to its population, as its nonmanufacturing employment/population ratios are well below levels for comparably sized geographic locales.

4. Growth in employment (manufacturing and nonmanufacturing) for both Regional Study Areas, is expected to advance at more moderate rates than in the past. This reflects the area's slow recovery during 1976 and 1977 from the national economic recession, slower rate of growth in overall economic activity and population for the total United States, and the greater size and maturity (relative to the 1960's) of the area's economic base.

Manufacturing employment projections by sector for the Pennsylvania Study Areas were derived by modifying sectoral forecasts prepared by OSPD to make them consistent with both the more recent national projections and the region's historical growth patterns. Projections prepared by OSPD for 1980 have been incorporated into the baseline estimates since they reflect reasonable estimates of short-term prospects. These projections implicitly assume that manufacturing employment by 1980 will grow to the record levels achieved in 1974. Given an increase in labor productivity, manufacturing production is estimated to be higher in 1980 than in 1974.

2.63
Sectoral employment projections for the nonmanufacturing sectors in the Pennsylvania Regional Study Area were derived in the following manner. For the population-serving sectors, including wholesale/retail trade, F.I.R.E., Government, communications, utilities, medical services, private education, and services, the historical and implied projected employment/population ratios for the nation, State, and study areas were computed. The historical and projected trends exhibited, on average, relatively consistent patterns among the areas and within the sectors. Minor modifications were made to some of the sector projections prepared by OSPD because the employment growth rates which these ratios implied were not consistent with the revised national projections. A similar approach was employed in projecting nonmanufacturing employment by sector in the Ohio Study Areas. Employment projections of the agriculture, transportation services, and construction sectors in the Pennsylvania Study Areas are based on specific assumptions regarding trends in each of these sectors. For employment in the agriculture sector, it was assumed that the number of farms in the area will continue to decline, however, at a much slower rate than in the past since the size of the farm population had already declined substantially by the early 1970's. Transportation services employment was assumed to increase moderately over the period, reversing the historical trend. Employment in this sector is expected to increase because the declines on rail-related activity have tapered off while port employment should increase slightly to accommodate heavier vessel traffic on Lake Erie. Construction employment is assumed to expand gradually.

2.64
Manufacturing employment projections for the Ohio Regional Study Area could not be derived in the same manner as they were for Pennsylvania. The manufacturing base in Ashtabula County is substantially smaller than its Pennsylvania counterpart. Manufacturing activity, unlike service activity, in an area is far more dependent on demand emanating outside the area. Since the manufacturing base in Ashtabula County is relatively small, historical growth in employment has been significantly affected by plant expansion and new

companies moving into the area. From 1960-1974, manufacturing employment in the Ohio Regional Study Area increased by more than 6,150 jobs, a 77 percent increase for the period. During the same period, manufacturing employment in the Pennsylvania Regional Study Area increased by more than 16,000 jobs, which represented only a 35 percent increase. Given the nature of the employment base and its historical percentage increase in Ashtabula County, an approach to generating manufacturing employment forecasts by sector and in toto for the Ohio Regional Study Area (based largely upon a comparison of the historical rate of growth of the Area's employment with that of other areas, e.g., Pennsylvania Regional Study Area, total U.S., etc.) was deemed inappropriate.

2.65
The projections of manufacturing employment in the Ohio Regional Study Area were derived judgmentally and were based upon the following set of assumptions. No expansion by present companies or entry of new large companies would occur during the projection period. This assumption is based on present and expected trends in the location of new manufacturing facilities in the United States (mainly toward the south and southwest) in light of economic, environmental, regulatory, and institutional factors and upon discussions with local, State, and Federal officials regarding the attractiveness of the Regional Study Area, especially relative to the decades of the 1960's and 1970's. During the 1960's there was a very concerted effort on the part of Ohio officials to attract new industry to the State. While such efforts are assumed to continue, the already large industrial base in the State would necessitate extremely large numbers of new entrants in order to maintain the historical rate of industrial attraction. Expansions of operations already in the Ohio Regional Study Area are assumed to occur at a moderate pace. The projections attempt to reflect expansions already underway or recently announced. Total manufacturing employment is expected to rebound in the short-term, regaining its 1974 levels by 1980. Due to the nature of the area's industrial base and its historical performance, recovery in the Regional Study Area from the nationwide recession of 1974-1975 is expected to lag the national recovery rate. Partly contributing to this more gradual recovery is the sharp falloff in economic activity that occurred in the area's economy as a result of the national recession. However, by 1980, recovery in the Regional Study Area is assumed to have been fully achieved and the employment levels in manufacturing of 1974 regained. In the 1980-1990 period, total manufacturing employment is expected to increase 12 percent. This overall rate of increase was conditioned by expected rates of growth in the various sectors of the area's manufacturing base in light of projected developments in these sectors both nationally and in neighboring areas. The distribution of employment within the components of the Regional Study Area of

each State was derived in the following manner. For the Pennsylvania Regional Study Area, the relative distribution between Regional and Principal Study Areas was derived from the OSPD projections. The subregional distribution of the Ohio Regional Study Area employment was derived by applying the 1975 relative area employment distribution to the projection period. This assumption appears to be reasonable based on the following. First, even though the Ohio Principal Study Area has historically increased its relative share of total county manufacturing employment (e.g., from 85.8 percent in 1960 to 89.2 percent in 1975), a continuation of this trend is not expected since major expansions or the relocation of new companies into the Ohio Principal Study Area are not anticipated. Second, while population in the Ohio Local Study Area is projected to grow somewhat faster than in the Principal Study Area, service sector activity should grow slightly faster in the Principal Study Area relative to Conneaut because of the existing concentration of population-serving activity, such as retail trade, in the Ashtabula City area.

Labor Force

2.66

Projections of the labor force in the total Regional Study Area were based on assumptions regarding future unemployment rates, projections of total employment, and the level and demographics of the resident population (refer to Table 2-31). In addition, it was necessary that projections of the age and sex composition of the population be prepared. *The total populaton of the Pennsylvania Regional Study Area* is projected to increase at the national rate of 0.7 percent per annum, and implicitly assumes no net migration. Population in the Ohio Regional Study Area is projected to increase at 0.5 percent per annum, which incorporates a net out-migration of 100 people per year. The potential labor force will be bounded by that part of the population aged 16 and over. The actual size of the labor force is composed of those persons in the over 16 year old age bracket gainfully employed or actively seeking employment. (The ratio of the labor force to total population is often referred to as "the participation rate".) The over 16 segment of the population is projected to increase more rapidly than the under 16 population through 1990 because of declining birth rates. For example, in 1975, this older age group comprised approximately 72 percent of total population, by 1990 this group is projected to comprise 77 percent of the total, implying that the potential labor force will be growing faster than the population. However, the over 65 population, which participates in the labor force at approximately one-third the rate of the under 65 group, will also be increasing relative to the total population (10.5 percent in 1975 to 12.3 percent in 1990). This latter trend will have a dampening effect on overall participation rates.

Table 2-31

Projected Population for the Ohio and Pennsylvania Regional Study Areas (Thousands)

	1975		1980		1985		1900	
	Ohio	PA	Ohio	PA	Ohio	PA	Ohio	PA
Total Population	102.0	356.6	104.4	370.8	107.3	383.4	109.8	396.4
Over 16 years of age	72.6	257.0	77.7	278.0	81.5	292.1	84.1	305.4
Male	34.6	121.3	37.1	131.5	38.9	138.0	40.1	143.9
Female	38.0	135.7	40.6	146.5	42.6	154.1	44.0	161.5

Source: Pennsylvania Office of State Planning and Development: Arthur D. Little, Inc. estimates.

2.67
The sex composition of the potential labor force is an important factor because of the significantly different participation rates for males and females. Females presently comprise 53 percent of the 16 and over population in the total Regional Study Area, however, only 40 percent of these females are presently active in the labor force. The participation rate among males in this age bracket is well over 75 percent in the Regional Study Area of both States. The projections of male and female Labor Force Participation Rates (LFPR) used in the analysis are based upon national projections made by the U.S. Bureau of Labor Statistics and estimates of female LFPR's in the Regional Study Area made by OSPD. These projections are presented in Table 2-32. Both sets of projections assume an increase in female participation rates. The OSPD projections effectively maintain the historical difference in female participation rates between the study area and the nation. For the purposes of the baseline estimate, the OSPD projections of female LFPR were adopted for both States' study areas. The national projections of male participation rates exhibit a marginal decline from 1975 levels. In the Pennsylvania Regional Study Area, male participation rates have been historically above the national rate. Although the national rate declined slightly from 1970-1975, the rate in the Pennsylvania Regional Study Area during this period increased substantially from 0.83 to 0.88, an unusual trend that is not expected to continue. Given the circumstances of that period (i.e., major increases in manufacturing employment), the present post-recessionary conditions in the Study Area, and the expected decline in the male rate nationally, a near-term male participation rate of approximately 0.82 has been assumed. During the 1980's, a further decline in male participation rates is anticipated because of a slower rate of growth in manufacturing employment and a larger percentage of the population over 65. A male labor force participation rate for the Pennsylvania Regional Study Area of 0.80 and 0.79 in 1985 and 1990, respectively, has been assumed, maintaining a two to three percentage point differential above the national rate. For the Ohio Regional Study Area, a male labor force participation rate of 0.79 was assumed throughout the projection period. This maintains the historical relationship for this area with the participation rate being lower than that of the Pennsylvania Regional Study Area, but higher than the national rate. Based on the above assumptions, the total labor force participation rate in the Ohio Regional Study Area would increase from approximately 0.59 in 1975 to 0.62 in 1990. In the Pennsylvania Regional Study Area, on the other hand, the participation rate will decline from its high level of 0.63 in 1975 to slightly over 0.61 in 1980 and thereafter increase gradually to 0.62 by 1990. During this period, the national rate is projected to increase from approximately 0.61 in 1975 to 0.64 in 1990.

Table 2-32

Labor Force Participation Rates for the Portion of the Population Aged 16 and Over

	1970	1975	1980	1985	1990
U.S. Average	0.600	0.612	0.623	0.632	0.636
Male	0.793	0.778	0.778	0.775	0.773
Female	0.430	0.463	0.484	0.503	0.514
Female					
Total Regional Study Area	0.380	0.409	0.427	0.445	0.455
Male					
Ohio Regional Study Area	N/A	0.800	0.790	0.790	0.790
Pennsylvania Regional Study Area	0.830	0.880	0.820	0.800	0.790

N/A = Not Available.

Source: Monthly Labor Review, December, 1976, Bureau of Labor Statistics, U.S. Department of Labor; Pennsylvania Office of State Planning and Development; Arthur D. Little, Inc. estimates.

Payroll Earnings

2.68
Sectoral payroll earnings per worker were maintained at the estimated 1975 levels. Theoretically, future levels of real wages per worker (per sector) are determined by advances in labor productivity and changes in the "real" cost of labor often measured in terms of monopoly (or monopsony) power. Estimation of either component of possible change in real wages per worker is difficult, moreover, actual changes in various industries may diverge significantly from theoretical expectations. Thus, the opportunity for compounding error is strongly increased. As a result, an acceptable alternative approach based on stable average wages per worker (per sector) measured in constant 1975 dollars was adopted. By not incorporating explicit productivity or other increases in the wage estimates, a conservative projection of total payrolls in the Regional Study Area was developed. Changes in total payroll earnings in the respective study areas therefore become solely a function of the differing growth rates in the sectoral employment projections.

Value of Shipments

2.69
Value of shipments was projected by assuming that the 1975 payroll/sales ratios for each industry would be constant over the 15-year projection period. This assumption appears reasonable given that it is measured in constant dollar terms and it implicitly assumes that over the long-term capital and labor maintain a near constant relationship. In the short-term, however, cycles in economic activity can result in fluctuations in the payroll/sales ratio.

Occupational Distribution of the Labor Force

2.70
The occupational distribution of the labor force is derived from sectoral employment projections. It has been assumed that projections of the general occupational distribution by industry prepared by the Bureau of Labor Statistics for the total United States are directly applicable to corresponding industries in the Regional Study Areas of both States. (2-3)

b) Projection Summary

2.71
The baseline projections of the total Regional Study Area exhibit the following overall patterns:

Total employment in the near term (i.e., 1975-1980) will likely grow more rapidly on an annual average basis, than during the

1980's as a result of the area's economy (particularly the manufacturing sector) rebounding from the recession of 1974-1975.

Through 1990, nonmanufacturing employment, especially in population-serving activities, will advance more rapidly than manufacturing employment, with overall employment growth not quite as rapid as in the late 1960's and early 1970's. Nonetheless, the manufacturing sector will remain the dominant force of the area's economy, measured in terms of value of production and generation of earnings.

Overall economic growth in the Regional Study Areas of both States is projected to proceed at fairly similar long-term rates.

The labor force in the Regional Study Area will continue to expand during the projection period at a decreasing rate as a result primarily of the changing age distribution of the population. This pattern of labor force growth for the area's economy results in the continuation of relatively high unemployment rates in the early phase of the projection period. However, over the longer term, area unemployment rates are assumed to decline and approach their historical relationship as compared to the nation.

Finally, for purposes of analysis, the projections do not assume or incorporate any major downturns in the future economy of the Regional Study Areas.

Employment Projections

Total Regional Study Area

2.72
Total employment in the Regional Study Area is projected to increase by over 44,000 between 1975 and 1990, surpassing a level of 230,000 by 1990. The average rate of employment growth in the Ohio Regional Study Area over the period will be somewhat faster than in the Pennsylvania counterpart resulting in a slight increase in the share of total Regional Study Area employment in Ohio from 18.8 percent in 1975 to 19.5 percent in 1990. The employment projections for the major employment categories in the total Regional Study Area are presented in Table 2-33. These projections show higher growth rates for 1975-1980 than during the succeeding periods. The more rapid growth in the early period is due to the expected recovery of the area's economy from the national recession of 1974-1975. Area manufacturing activity, which is lagging the nationwide recovery from the

Table 2-33

Employment Projections in the Regional Study Area

Category	Thousands				Percent Change		
	1975	1980	1985	1990	1975-80	1980-85	1985-90
Total	186.0	205.0	217.7	230.4	10.2%	6.2%	5.8%
Manufacturing	67.9	76.8	80.6	84.3	13.1	5.0	4.6
Non-Manufacturing	118.1	128.2	137.1	146.1	8.6	6.9	6.6
Population-Serving (1)	99.6	109.1	117.2	125.2	9.5	7.4	6.8
Other	18.5	19.1	19.9	20.9	3.2	4.2	5.0

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(1) Includes wholesale/retail trade; finance, insurance, and real estate (F.I.R.E.), communications; utilities; government; and services.

Source: Pennsylvania Office of State Planning and Development; Arthur D. Little, Inc. estimates.

recession, is projected to rebound from its 1975 depths and regain or slightly surpass 1974 levels of employment by 1980. The non-manufacturing sector suffered only minor job losses during the recent recessionary period and its employment by 1980 is projected to be five percent above 1974 levels. Throughout the 1980's, baseline employment growth is likely to be more moderate for all sectors, averaging approximately 1.2 percent per annum, with an additional 25,000 jobs projected for the economy of the total Regional Study Area. In line with national trends, the selected services sector will provide the major share of the employment growth for the economy, increasing employment approximately 18,000 by 1990.

Ohio Study Areas

2.73
Ohio Regional Study Area. Total employment in the Ohio Regional Study Area is projected to increase by approximately 28 percent or 10,000 jobs between 1975 and 1990. This expansion in total employment reflects a slower rate of gain than that which took place in the previous 15 years. The primary reason for this relatively slower rate of future employment growth is that the magnitude and frequency of new plant locations and existing plant expansions in the manufacturing sector of the Regional Study Area are not anticipated to achieve the pace experienced during the past 15 years.

2.74
Ohio Local Study Area. Total employment in Conneaut is projected to increase by 1,340 jobs from 5,330 in 1975 to 6,670 in 1990. This equates to an average increase of 90 jobs per year versus the historical long-run rate of job expansion of approximately 110 jobs per year. Employment projections for Conneaut are shown in Table 2-34. The projection depicts a gradual shift in the economy of Conneaut. By the late 1980's, population-serving employment in the Ohio Local Study Area is projected to exceed manufacturing employment. This relatively faster rate of growth in the service sector reflects the slow maturing of the Ohio Local Study Area economy which is expected to continue over the next 15 years.

2.75
Ohio Principal Study Area. The Ohio Principal Study Area, especially the area in and around Ashtabula City, will continue to be the economic center of Ashtabula County. Total employment in the Ohio Principal Study Area is projected to increase by approximately 8,000 jobs or 29 percent from 27,705 in 1975 to 35,680 by 1990. Over half of this increase reflects the area's regaining of its peak 1974 level of total employment by 1980. The employment projections for the Ohio Principal Study Area are presented in Table 2-35. Total employment is projected to increase rapidly between 1975-1980, mainly due to the

Table 2-34

Employment Projections for the Ohio Local Study Area

	1975	1980	1990
Total Employment	5,330	5,910	6,670
Manufacturing	2,315	2,650	2,850
Fabricated Metals/Machinery	1,265	1,360	1,495
Chemicals/Rubber	490	600	635
Other Manufacturing	560	690	720
Non-Manufacturing	3,015	3,260	3,820
Population Serving (1)	2,215	2,440	2,955
Other Non-Manufacturing	800	820	865

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(1) Includes wholesale/retail trade, finance, insurance, and real estate (F.I.R.E.), communications, utilities, government, and services.

Source: Arthur D. Little, Inc. estimates.

Table 2-35

Employment Projections for the Ohio Principal Study Area

	1975	1980	1990
Total Employment	27,705	31,450	35,680
Manufacturing	10,935	13,265	14,150
Primary Metals	950	1,585	1,675
Fabricated Metals and Machinery	3,555	3,830	4,200
Other Durables	2,125	2,725	2,950
Chemicals/Rubber	3,460	4,250	4,500
Other Non-durables	845	875	825
Non-Manufacturing	16,770	18,185	21,530
Wholesale/Retail	5,550	5,975	6,925
F.I.R.E.	800	925	1,200
Utilities	805	850	950
Communication	300	315	350
Services	3,480	3,910	5,050
Government	2,425	2,695	3,325
Transportation Services	1,800	1,850	1,950
Construction	1,050	1,140	1,355
Agriculture/Mining	560	525	425

Source: Arthur D. Little, Inc. estimates.

recovery in the manufacturing sector, from the nationwide recession of 1974-1975. Manufacturing employment in the Ohio Principal Study Area, similar to that in its Pennsylvania counterpart, is projected to recover by 1980 the substantial employment losses suffered in the mid-1970's recession. The nonmanufacturing sector, because it was not affected nearly as much as the manufacturing sector by the recession, is expected to exhibit more moderate growth for the remainder of the 1970's. During the 1980's, total employment in the Ohio Principal Study Area is projected to increase by over 4,000 jobs of which over 3,000 are expected in the nonmanufacturing sector. The largest gains in employment are projected to be in the commercial sector (wholesale/retail trade, F.I.R.E., and services) as a result largely of increasing population and the expansion of the area's commercial base. The medical services sector is also expected to continue to grow rapidly in response to growing demand. Manufacturing employment is assumed to exhibit only moderate expansion during the 1980's.

Pennsylvania Study Areas

Since the Pennsylvania Local Study Area has a limited industrial base, employment projections were not prepared by the applicant.

2.76
Pennsylvania Regional Study Area. The Pennsylvania Regional Study Area economy is projected to continue to grow at a healthy pace throughout the 1980's, but at a slower rate than that which occurred during the 1960-1975 historical period. Total employment in the Pennsylvania Regional Study Area is projected to increase from approximately 151,100 in 1975, to 185,000 in 1990, an increase of 33,900 jobs or 22 percent. The 1975-1990 employment increase translates into a long-term average annual growth rate of 1.3 percent which is approximately 60 percent of the historical annual rate of employment growth. The primary contributor to Pennsylvania Regional Study Area economic growth will be the Principal Study Area where total employment is projected to increase by more than 25,000 from 109,600 in 1975 to 136,000 in 1990. The geographic distribution of manufacturing employment in the Principal Study Area is not expected to change significantly with the city of Erie and its immediate environs gaining most of the manufacturing growth. However, larger percentage gains in service employment are expected in the outlying communities of the Principal Study Area where higher population growth is anticipated.

2.77
Pennsylvania Principal Study Area. The employment projections for the Pennsylvania Principal Study Area are presented in Table 2-36. Total employment is projected to increase by 11,000 between 1975 and

Table 2-36

Employment Projections in the Pennsylvania Principal Study Area

	1975	1980	1990
Total Employment	109,618	120,650	136,000
Manufacturing	42,103	47,155	52,600
Stone, Clay & Glass	173	200	225
Primary Metals	2,742	3,075	2,925
Fabricated Metals/Machinery	15,014	17,170	19,725
Other Durables	16,371	18,700	21,650
Chemicals/Rubber	3,605	3,785	3,850
Other Non-Durables	4,198	4,225	4,225
Non-Manufacturing	67,515	73,495	83,400
Wholesale/Retail Trade	20,864	23,355	26,350
F.I.R.E.	3,825	4,210	4,950
Utilities	712	725	750
Communications	1,495	1,810	2,275
Services	19,525	21,280	23,975
Medical Services	6,082	6,700	7,600
Private Education	2,273	2,730	3,125
Selected Services	11,170	11,850	13,250
Government	12,177	12,790	14,400
Transportation Services	3,411	3,510	3,850
Construction	3,558	4,045	5,380
Agriculture/Mining	1,948	1,770	1,470

Source: Pennsylvania Office of State Planning and Development; Arthur D. Little, Inc. estimates.

1980 and by an additional 15,300 during the 1980's, reaching a level of 136,000 by 1990. Total manufacturing employment for the projection period is estimated to expand by approximately 25 percent or 10,000 jobs, with almost half this growth taking place between 1975 and 1980. The 1980 level of manufacturing employment is estimated to be only slightly above 1974 levels. Area manufacturing employment growth will stem primarily from increased activity in the fabricated metals/machinery and other durable goods sectors. Employment in these two sectors is expected to expand by over 30 percent between 1975 and 1990. Employment in all manufacturing sectors is expected to recover from the 1975 recession lows during the initial projection years, but thereafter employment declines are projected for primary metals, while both chemicals/rubber, and other nondurables are expected to show very marginal gains. Primary metals employment is projected to decline regionally, as well as nationally, because of the continued greater utilization of more automated production techniques. Nonmanufacturing employment is projected to expand by approximately 16,000 jobs between 1975 and 1990. However, unlike manufacturing, nonmanufacturing employment should expand on a fairly smooth growth path during the projection period. The population-serving sectors will be the primary generators of new nonmanufacturing jobs in the Principal Study Area. Such employment is projected to increase by approximately 14,000 jobs from 58,600 in 1975 to 72,700 in 1990. The largest increases in employment are expected in wholesale/retail trade (5,500), Government (2,200), and selected services (4,450), which in total will account for over 75 percent of the net job generation in the nonmanufacturing sector during the 15-year period.

Labor Force and Unemployment Projections

2.78
Employment data presented earlier in this discussion and the projections appearing in Table 2-33 through 2-36 are based on place of work. Labor force data are reported on a place of residence basis. For purposes of this analysis, it was necessary to estimate employment on a place of residence basis.

Total Regional Study Area

2.79
The growth of the labor force throughout the Regional Study Area is expected to be dominated by the following two developments, one, the labor force will increase but at a decreasing rate throughout the period, and two, over this period, females will comprise a larger proportion of the total labor force. The labor force of the total Regional Study Area is projected to increase by 17 percent between 1975 and 1990, approximately 50 percent faster than the projected

growth in area population. The labor force will grow faster than population because female participation rates are assumed to continue to increase and the potential labor force (i.e., 16 and over age group) is projected to comprise an increasing share of the total population (refer to Table 2-37). The total labor force is expected to grow by 1.2 percent per annum between 1975 and 1980, slowing to an annual growth rate of 0.9 percent by the late 1980's. Even though growth in the labor force is projected to slow over time, the total labor force participation rate (i.e., the ratio of labor force to population 16 and over) will be increasing throughout the 1980's. The composition of the labor force will continue to shift toward more females as a percent of total labor force. Females are projected to comprise approximately 39.5 percent of the Regional Study Area labor force by 1990, up from approximately 35 percent in 1975.

Ohio Regional Study Area

2.80
The labor force in the Ohio Regional Study Area is projected to increase by approximately 9,000 from 43,179 in 1975 to 52,150 by 1990. The pattern of labor force growth will parallel that of the Pennsylvania Regional Study Area, given the similar basic assumptions concerning changes in labor force participation rates. Labor force projections for the Ohio Regional Study Area are presented in Table 2-38. A consistent set of historical information for resident and place-of-work employment was not available for the Ohio Regional Study Area. The limited data available suggest that Ashtabula County, unlike Erie County, exhibits net out-commuting of workers (i.e., more employed residents than jobs in the county). However, based upon estimates of county employment and the U.S. Census estimates of resident employment for the years 1960 and 1970, 18 percent of county residents worked outside the county in 1960, by 1970, this figure had fallen to five percent. This trend suggests a significant shift in the commutation patterns of the county workforce. Although the data and the direction of the shift are likely to be an accurate reflection of what transpired during this period, the magnitude of the shift suggested by the data appears excessive. For 1974 and 1975, place-of-work employment estimates when combined with the estimates of resident employment made by the Ohio Bureau of Employment Services suggest a net outmigration of workers of approximately 10 percent of the resident employment in both years. For the projection period, employment on a place-of-work basis is assumed to be equal to 90 percent of resident employment. This assumption appears to yield a reasonable approximation of the commutation patterns in the Regional Study Area given the economic base of the area and its proximity to the Erie, Cleveland, and Youngstown/Warren areas. The projected levels of employment, labor force, and unemployment for the Ohio Regional Study Area are presented in Table 2-39. The rate of

Table 2-37

Labor Force Projections in the Total Regional Study Area
(Thousands)

	1975	1980	1985	1990
Total Labor Force	205.0	217.4	229.6	240.1
Males	133.6	136.9	141.1	145.6
Females	71.4	80.5	88.5	94.5

Source: Arthur D. Little, Inc. estimates.

Table 2-38

Labor Force Projections in the Ohio Regional Study Area

(Thousands)

	1975	1980	1985	1990
Total Labor Force	43.2	46.6	49.7	52.1
Male	27.6	29.1	30.7	31.9
Female	15.6	17.5	19.0	20.2

Source: Arthur D. Little, Inc. estimates.

Table 2-39

Employment, Labor Force, and Unemployment Projections for the Ohio Regional Study Area (Thousands)

	1975	1980	1985	1990
Civilian Resident Labor Force	43.2	46.6	49.7	52.1
Employment				
Place-Of-Work	34.9	39.5	42.3	44.9
Resident	38.5	43.4	46.5	49.4
Unemployment				
Level	4.7	3.2	3.2	2.7
Rate	10.8%	6.9%	6.4%	5.3%

Source: Arthur D. Little, Inc. estimates.

Table 2-40

Labor Force Projections for the Pennsylvania Regional Study Area (Thousands)

	1975	1980	1985	1990
Total Labor Force	161.8	170.8	179.9	188.0
Males	106.0	107.8	110.4	113.7
Females	55.8	63.0	69.5	74.3

Source: Arthur D. Little, Inc. estimates.

unemployment in the Ohio Regional Study Area implied by the employment and labor force projections is quite similar to that of its Pennsylvania counterpart. The unemployment rate is sensitive to the projections of area employment and labor force, as well as the relationship of area employment to resident employment. Projections indicate a level of unemployment in Ashtabula County ranging from a high of 3,200 in the early 1980's declining to 2,700 by the late 1980's.

Pennsylvania Regional Study Area

2.81
The labor force of the Pennsylvania Regional Study Area is projected to increase to 188,000 by 1990 from approximately 162,000 in 1975 (refer to Table 2-40). The Pennsylvania Regional Study Area is estimated to comprise almost 80 percent of the labor force in the total Regional Study Area of both States. Within Pennsylvania, the Principal Study Area is projected to account for approximately 72 percent of the total labor force. The pattern of labor force growth in the Pennsylvania Regional Study Area will be similar to that of the total Regional Study Area (i.e., increasing at a decreasing rate). Females will comprise an increasing share of the total labor force as their participation rates increase and the male participation rates decline from their 1975 peak. The unemployment rate for the Regional Study Area is derived by comparing projections of employment by place of residence, employment by place of work, and the resident labor force. Historically, Regional Study Area employment on a place of residence basis has been less than place-of-work employment. The difference between the two reflects both dual job holders in the resident population and the net daily in-migration of workers living outside the area who hold jobs within the Regional Study Area. During the years 1970-1975, the ratio of employment by place of residence to employment by place of work varied from a low of 94.7 percent in 1973 to a high of 96.8 percent in 1975, averaging 95.7 percent for the period. For the future, this ratio is expected to remain close to its recent high level for the following reasons. One, as the labor participation rates of females increase, dual job holdings can be expected to decline as fewer husbands need to hold two jobs. Two, the future cost of gasoline can be expected to have a dampening effect on commuting distances, thereby reducing the relative level of worker in-migration. The projected levels of employment and labor force are presented in Table 2-41. Two levels of employment by place of residence have been prepared. One level reflects resident employment at 96 percent of place-of-work employment, somewhat above the average of the 1970-1975 period. The other reflects resident employment at 97 percent of place-of-work employment, just above the 1975 ratio. As can be seen from Table 2-41, the unemployment rate is highly sensitive to the relationship

Table 2-41

Employment, Labor Force, and Unemployment Projections for the Pennsylvania Regional Study Area (Thousands)

	Actual 1975	1980	1985	1990
Civilian Resident Labor Force	161.8	170.8	179.9	188.0
Employment				
Place-Of-Work	151.1	165.5	175.4	185.4
A. Resident (0.96)	146.3(1)	158.9	168.4	178.0
B. Resident (0.97)	N/A	160.5	170.1	179.8
Unemployment				
A. Level	15.5	11.9	11.5	10.0
Rate	9.6%	7.0%	6.4%	5.3%
B. Level	N/A	10.3	9.8	8.2
Rate	N/A	6.0%	5.4%	4.4%

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(1) Resident employment ratio was estimated at 96.8% in 1975.

A. Resident employment @ 96% of place-of-work

B. Resident employment @ 97% of place-of-work

N/A = Not Applicable.

Source: Arthur D. Little, Inc. estimates.

between resident employment and place-of-work employment. Based on the recent relationship between resident employment and place-of-work employment (0.968) and its expected decline, the unemployment rate for the Pennsylvania Regional Study Area is estimated at seven percent in 1980 and 5.3 percent in 1990. (Assuming a ratio of 0.97, the estimate of the unemployment rate would be one percentage point lower through the projection period.) This suggests a relatively high unemployment rate for most of the 1980's. The pattern appears reasonable in light of the area's slow recovery from the recent recession, the outlook for economic growth both nationally and in the area, the area's geographic locale, age, and composition of its industrial base, and the outlook for unemployment at the national level. Although projections of the rate of unemployment for the various communities and townships within the Pennsylvania Regional Study Area have not been explicitly derived, the following patterns might be anticipated. Unemployment is likely to be higher in those areas where the labor skill levels are lower than Regional Study Area averages (e.g., Erie City). Conversely, unemployment rates can be expected to be lower than the Regional Study Area average in the suburban areas, where the skill levels of the residents would on average be high. The total level of unemployment is estimated to be approximately 11,900 in 1980 compared to 15,500 in 1975. Thereafter, the level of unemployment is projected to decline to approximately 10,000 by 1990.

Projections of Sectoral Payrolls and Average Wages

2.82
The sectoral growth in payrolls, as stated in the methodology section, is directly related to the growth in employment and current (i.e., 1975) average wages per worker in each sector. Thus, the projections of total payroll earnings are based upon the varying rates of employment growth in the individual sectors and the associated wages per worker in each sector.

Total Regional Study Area

2.83
The projections of total payrolls for both manufacturing and nonmanufacturing activity in the total Regional Study Area are shown in Table 2-42. Over the projection period, total Regional Study Area payrolls (in 1975 dollars) are estimated to increase by 25 percent from approximately $1.8 billion in 1975 to almost $2.3 billion by 1990. Despite differentials in the rate of employment growth and average wages per worker, total payroll in both the manufacturing and nonmanufacturing sectors is estimated to increase at approximately the same rates between 1975 and 1990.

Table 2-42

Total Payroll Earnings Projections for the Total Regional Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$1,184.9	$2,022.3	$2,261.9
Manufacturing	825.6	934.8	1,024.2
Non-Manufacturing	989.3	1,087.5	1,237.7

Source: Arthur D. Little, Inc. estimates.

Ohio Study Areas

2.84
Ohio Regional Study Area. Total payroll earnings (in 1975 dollars) generated by all industry in the Ohio Regional Study Area are projected to increase by 29 percent from $333 million in 1975 to $430 million by 1990, a slightly faster rate than that projected for the Pennsylvania Regional Study Area (refer to Table 2-43). By 1990, manufacturing payrolls in the area are estimated to comprise approximately 42 percent of the total, essentially the same percentage as in 1975.

2.85
Ohio Local Study Area (Conneaut). The Ohio Local Study Area is estimated to represent approximately one-sixth of Ohio Regional Study Area payroll earnings (refer Table 2-44). Total payrolls in Conneaut are projected to increase by 24 percent from $54.2 million in 1975 to $67.4 million in 1990, a somewhat slower growth rate than that projected for Ashtabula County. Manufacturing payrolls are estimated to comprise 46 percent of total earnings generated in Conneaut by 1990, essentially the same proportion as in the county. The fabricated metals/machinery sector should continue to be the largest payroll generator in Conneaut, although the chemicals/rubber sector is projected to have a higher rate of total earnings growth.

2.86
Ohio Principal Study Area. Total payroll earnings in the Ohio Principal Study Area are projected to increase from approximately $269 million in 1975 to $349 million by 1990 as shown in Table 2-45. Manufacturing payrolls are estimated to increase approximately 31 percent from $122 million in 1975 to $160 million by 1990. The largest contributors to the growth in manufacturing earnings are expected to be chemicals/rubber, fabricated metals/machinery, and other durable goods sectors. The chemicals/rubber industry should continue to generate the largest dollar value of payrolls in the Ohio Principal Study Area followed by the fabricated metals/machinery sector. Area payroll earnings in the nonmanufacturing sectors are expected to increase from $147 million in 1975 to $189 million by 1990. Similar to the Ohio Local Study Area, area nonmanufacturing sector earnings should expand primarily due to the expansion of the selected services and wholesale/retail trade sectors. Payrolls in these two sectors are estimated at almost $81 million in 1990, up from $59 million in 1975.

Pennsylvania Study Areas

2.87
Pennsylvania Regional Study Area. Total payroll earnings in the Pennsylvania Regional Study Area are projected to increase from

Table 2-43

Projected Payroll Earnings for the Ohio Regional Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$333.4	$380.9	$429.7
Manufacturing	135.7	167.5	178.5
Stone, Clay and Glass	1.5	2.0	2.3
Primary Metals	14.9	24.9	26.1
Fabricated Metals/Machinery	45.8	49.4	54.1
Other Durables	24.9	31.8	34.2
Chemicals/Rubber	39.6	49.8	52.7
Other Non-Durables	8.9	9.6	9.1
Non-Manufacturing	197.7	213.4	251.2
Wholesale/Retail Trade	43.8	47.1	54.6
F.I.R.E.	8.8	10.0	13.1
Utilities	17.0	17.7	19.0
Communications	3.8	4.2	5.0
Services	35.4	39.9	51.4
Transportation Services	29.6	30.4	32.2
Construction	19.2	20.9	24.8
Agriculture/Mining	6.8	6.2	5.3
Government	33.3	37.0	45.8

Source: Arthur D. Little, Inc. estimates.

Table 2-44

Projected Payroll Earnings for the Ohio Local Study Area
(Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$54.2	$60.1	$67.4
Manufacturing	25.2	28.9	31.2
Fabricated Metals/Machinery	13.4	14.4	15.9
Chemicals/Rubber	5.6	6.8	7.2
Other Manufacturing	6.2	7.7	8.1
Non-Manufacturing	29.0	31.2	36.2
Commercial(1)	7.8	8.6	10.5
Other(2)	10.7	11.9	14.4
Transportation Services	7.7	7.8	8.3
Construction	2.8	2.9	3.0

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(1) Commercial includes wholesale/retail trade, F.I.R.E., and selected services.

(2) Other includes utilities, communications, private education, medical services, and government.

Source: Arthur D. Little, Inc. estimates.

Table 2-45

Projected Payroll Earnings for the Ohio Principal Study Area
(Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$269.2	$309.6	$348.8
Manufacturing	121.9	149.3	159.6
Stone, Clay, and Glass	1.4	1.8	2.2
Primary Metals	11.8	19.7	20.8
Fabricated Metals/Machinery	37.8	40.7	44.6
Other Durables	24.0	30.6	33.1
Chemicals/Rubber	39.1	48.1	51.0
Other Non-Durables	7.8	8.4	7.9
Non-Manufacturing	147.3	160.3	189.2
Wholesale/Retail Trade	33.6	36.2	41.9
F.I.R.E.	6.1	7.0	9.1
Utilities	12.2	13.0	14.4
Communications	2.6	2.8	3.1
Services	25.8	30.0	38.7
Transportation Services	23.9	24.6	26.0
Construction	13.0	14.1	16.8
Agriculture/Mining	3.3	3.0	2.5
Government	26.7	29.6	36.7

Source: Arthur D. Little, Inc. estimates.

approximately $1.5 billion in 1975 to $1.8 billion by 1990 (refer to Table 2-46). Approximately $155 million of the $350 million increase in total area payrolls is estimated to originate in the manufacturing sector as earnings in this sector increase from $690 million to $846 million. Manufacturing payrolls should comprise approximately 46 percent of total Regional Study Area earnings by 1990, essentially the same as in 1975. Nonmanufacturing payrolls are estimated to increase by approximately $200 million from $792 million in 1975 to $987 million by 1990.

2.88
Pennsylvania Principal Study Area. The Pennsylvania Principal Study Area will continue to be the primary component of the Pennsylvania Regional Study Area economy. Its share of the Pennsylvania Regional Study Area payroll earnings is projected to be almost 75 percent by 1990 which represents a marginal increase during the projection period (refer to Table 2-47). Total payroll earnings in the area are estimated to increase by 25 percent from $1.1 billion in 1975 to $1.4 billion by 1990. Manufacturing payrolls are estimated to increase from $524 million in 1975 to $655 million by 1990 which is equivalent to almost 50 percent of total payrolls in the Pennsylvania Principal Study Area. Within the manufacturing sector, the other durable goods sector should exhibit the largest increase in payroll earnings generation, increasing by 32 percent over the period from $223 million to $295 million. Payroll growth in the fabricated metals/machinery sector is projected to be somewhat slower, increasing from $166 million to $218 million. In the nonmanufacturing sector, payroll growth is also expected to be substantial. Total nonmanufacturing payrolls are estimated to increase by approximately 25 percent from $564 million to $705 million. In particular, wholesale/retail trade as well as selected services are projected to generate the greatest increase in area payrolls. Payroll earnings in agriculture/mining are estimated to actually decline over the period due to a continual drop in employment in this sector.

Projections of Value of Shipments

2.89
Projections of value of shipments originating in the two Regional Study Areas through 1990 are presented in Tables 2-48 and 2-49. The use of a constant payroll/sales ratio assumed in deriving these shipment estimates results in estimates of growth in value of shipments which essentially parallel that of sectoral payroll earnings based on projected employment. By 1990, total Regional Study Area production is estimated to reach $8.5 billion, a 24 percent increase over 1975 levels. Production in the nonmanufacturing sector of the total Regional Study Area is projected to increase somewhat more rapidly

Table 2-46

Projected Payroll Earnings for the Pennsylvania Regional Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$1481.5	$1641.4	$1832.2
Manufacturing	689.9	767.3	845.7
Stone, Clay, and Glass	10.8	12.5	13.1
Primary Metals	79.0	88.5	84.4
Fabricated Metals/Machinery	219.4	250.8	288.7
Other Durables	244.8	275.2	321.7
Chemicals/Rubber	68.0	72.0	71.7
Other Non-Durables	67.9	68.3	66.1
Non-Manufacturing	791.6	874.1	986.5
Wholesale/Retail Trade	199.0	233.8	252.1
F.I.R.E.	44.4	49.0	57.4
Utilities	12.5	12.8	13.2
Communications	25.5	30.9	38.8
Services	206.8	227.0	256.8
Transportation Services	55.6	57.2	62.8
Construction	72.6	82.9	107.8
Agriculture/Mining	22.3	19.9	16.7
Government	152.9	160.6	180.9

Source: Pennsylvania Department of Commerce, Division of Research and Planning; Arthur D. Little, Inc. estimates.

Table 2-47

Projected Payroll Earnings for the Pennsylvania Principal Study Area
(Millions of 1975 Dollars)

	1975	1980	1990
Total Payrolls	$1087.7	$1202.7	$1359.6
Manufacturing	524.1	587.9	654.7
Stone, Clay and Glass	2.0	2.3	2.6
Primary Metals	47.7	53.5	50.9
Fabricated Metals/Machinery	166.1	189.9	218.2
Other Durables	222.7	254.4	294.5
Chemicals/Rubber	39.5	41.4	42.1
Other Non-Durables	46.1	46.4	46.4
Non-Manufacturing	563.6	614.8	704.9
Wholesale/Retail Trade	143.1	160.2	180.8
F.I.R.E.	31.9	35.1	41.3
Utilities	9.0	9.2	9.5
Communications	18.3	22.1	27.8
Services	148.1	162.6	183.6
Transportation Services	39.8	41.0	44.9
Construction	52.5	59.3	78.9
Agriculture/Mining	11.4	10.3	8.6
Government	109.5	115.0	129.5

Source: Pennsylvania Department of Commerce, Division of Research and Planning; Arthur D. Little, Inc. estimates.

Table 2-48

Projected Value of Shipments for the Ohio Regional Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Shipments	$1262.6	$1425.4	$1589.8
Manufacturing	492.2	601.6	639.4
Stone, Clay, and Glass	5.4	7.4	8.5
Primary Metals	51.5	85.9	90.0
Fabricated Metals/Machinery	157.9	170.3	186.6
Other Durables	86.0	109.7	117.9
Chemicals/Rubber	132.1	164.3	175.7
Other Non-Durables	59.3	64.0	60.7
Non-Manufacturing	770.4	823.8	950.4
Wholesale/Retail Trade	398.2	428.2	496.4
F.I.R.E.	58.4	66.7	87.3
Utilities	85.4	88.5	95.0
Communications	9.0	10.0	11.9
Services	57.1	65.0	84.6
Transportation Services	73.9	76.0	80.5
Construction	50.6	55.0	65.3
Agriculture/Mining	37.8	34.4	29.4

Source: Arthur D. Little, Inc. estimates.

Table 2-49

Projected Value of Shipments for the Pennsylvania Regional Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Shipments	$5634.1	$6314.5	$6936.6
Manufacturing	2591.9	2860.6	3124.4
Stone, Clay, and Glass	39.8	46.3	48.5
Primary Metals	272.4	305.2	291.0
Fabricated Metals/Machinery	756.4	864.8	995.5
Other Durables	844.0	949.0	1109.7
Chemicals/Rubber	226.6	240.0	239.0
Other Non-Durables	452.7	455.3	440.7
Non-Manufacturing	3042.2	3453.9	3812.2
Wholesale/Retail Trade	1809.2	2125.5	2291.8
F.I.R.E.	295.9	326.7	382.7
Utilities	60.7	62.2	64.1
Communications	105.7	128.1	160.8
Services	320.1	339.6	379.3
Transportation Services	139.0	143.0	157.0
Construction	191.0	218.2	283.7
Agriculture/Mining	120.6	110.6	92.8

Source: Pennsylvania Department of Commerce; Census of Manufacturers, Census of Wholesale and Retail Trade, Census of Selected Services, U.S. Department of Commerce; Arthur D. Little, Inc. estimates.

than in the manufacturing sector, 25 percent compared to 22 percent for the 15-year period. Projections through 1990 of value of shipments by sector for the Ohio Principal and Local Study Areas, are shown in Tables 2-50 and 2-51, respectively. Projections through 1990 of value of shipments by sector for the Pennsylvania Principal Study Area are presented in Table 2-52.

Occupational Distribution of Resident Labor Force

2.90
The occupational distribution of the area labor force is expected to change, on the average, only slightly over the projection period. The primary change in the sectoral employment distribution will be a gradual shift toward those occupation characteristics of non-manufacturing sectors.

Total Regional Study Area

2.91
The occupational distribution of the total Regional Study Area labor force for 1970 and a projection for 1990 are presented in Table 2-53. The only substantial changes expected in the occupational distribution of the Total Regional Study Area labor force are related to persons employed as operatives and clericals. The percentage of persons employed in the Regional Study Area as operatives is estimated to decline from 23.8 percent in 1970 to 18.8 percent in 1990. Nationally, this ratio is expected to decline from 17.6 percent in 1970 to 14.7 percent in 1985, still considerably below the Regional Study Area average. This trend reflects the relative decline in manufacturing employment and the increase in automation of many manufacturing processes expected to occur on a nationwide level over the next 10-15 years. Clericals as a percentage of the Regional Study Area labor force are projected to increase from 15.1 percent in 1970 to 18.5 percent in 1990 largely because of the relative rise in non-manufacturing employment. Nationally, clericals are projected to be 19.5 percent of the labor force by 1985. The relative shares of the remaining occupations do exhibit some changes over the period, but at a much more limited rate. For example, the percentages of persons employed as laborers and sales personnel are each expected to change by less than one percentage point. Laborers will exhibit a modest relative increase primarily because the employment projections for the construction sector are expected to offset the decline in laborers employed in agriculture. The percentage of persons employed as administrators, craftsmen, and service personnel are each expected to exhibit changes of only two percentage points.

Table 2-50

Projected Value of Shipments for the Ohio Principal Study Area
(Millions of 1975 Dollars)

	1975	1980	1990
Total Shipments	$1007.5	$1144.9	$1273.4
Manufacturing	441.5	536.7	570.4
Stone, Clay, and Glass	5.2	6.7	8.1
Primary Metals	40.8	67.9	71.7
Fabricated Metals/Machinery	130.1	140.3	153.8
Other Durables	82.9	105.5	114.1
Chemicals/Rubber	130.6	160.3	170.0
Other Non-Durables	51.9	56.0	52.7
Non-Manufacturing	566.0	608.2	703.0
Wholesale/Retail Trade	305.9	329.1	380.9
F.I.R.E.	40.6	46.7	60.7
Utilities	61.2	65.0	72.0
Communications	6.3	6.7	7.4
Services	39.7	45.4	58.9
Transportation Services	59.8	61.5	65.0
Construction	34.2	37.1	44.2
Agriculture/Mining	18.3	16.7	13.9

Source: Arthur D. Little, Inc. estimates.

Table 2-51

Projected Value of Shipments for the Ohio Local Study Area
(Millions of 1975 Dollars)

	1975	1980	1990
Total Shipments	$191.3	$210.9	$234.4
Manufacturing	92.8	106.2	113.6
Fabricated Metals/Machinery	46.3	49.7	54.8
Chemicals/Rubber	18.5	22.7	24.0
Other	28.0	33.8	34.8
Non-Manufacturing	98.5	104.7	120.8
Commercial(1)	57.2	62.2	74.9
Other(2)	14.8	15.4	17.2
Transportation Services	19.1	19.5	20.8
Construction	7.4	7.6	7.9

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(1) Commercial includes wholesale/retail trade, F.I.R.E., and services.

(2) Other includes only utilities and communications.

Source: Arthur D. Little, Inc. estimates.

Table 2-52

Projected Value of Shipments of the Pennsylvania Principal Study Area (Millions of 1975 Dollars)

	1975	1980	1990
Total Shipments	$4042.2	$4520.2	$5075.0
Manufacturing	1909.2	2172.3	2402.6
Stone, Clay, and Glass	7.5	8.5	9.6
Primary Metals	122.4	184.5	175.5
Fabricated Metals/Machinery	572.7	654.8	752.4
Other Durables	767.9	877.2	1015.5
Chemicals/Rubber	131.5	138.0	140.3
Other Non-Durables	307.2	309.3	309.3
Non-Manufacturing	2133.0	2347.9	2672.4
Wholesale/Retail Trade	1301.2	1456.4	1643.6
F.I.R.E.	212.8	234.0	275.3
Utilities	44.9	46.0	47.5
Communications	43.5	52.6	66.2
Services	229.1	243.2	272.1
Transportation	99.5	102.5	112.3
Construction	138.2	156.0	207.6
Agriculture/Mining	63.8	57.2	47.8

Source: Pennsylvania Department of Commerce; Census of Manufacturers, Census of Wholesale and Retail Trade, Census of Selected Services, U.S. Department of Commerce; Arthur D. Little, Inc. estimates.

Table 2-53

Projected Occupational Percentage Distribution of Labor Force for the Regional Study Area

	1970	1990
Professional, Technical & Kindred	12.1%	12.4%
Administrators and Managers	8.9	11.3
Clericals	15.1	18.5
Salespersons	6.6	6.1
Craftsmen/Foremen	16.9	14.6
Operatives	23.8	18.8
Service Personnel	11.2	13.3
Laborers	4.4	5.0
Not Classified	1.0	---

Source: Arthur D. Little, Inc. estimates.

Ohio Regional Study Area

2.92
The occupational distribution of the Ohio Regional Study Area labor force for 1970 and a projection for 1990 are presented in Table 2-54. The trends and patterns depicted in this table are similar to those of the Pennsylvania Regional Study Area with some minor exceptions. The number of persons in the area employed as operatives is estimated to actually decline between 1970 and 1990. However, the percentage of operatives in the Ohio Regional Study Area (18.7 percent) in 1990 is still expected to be above the national average for this occupation (14.7 percent in 1985) while remaining about equal to that of the Pennsylvania Regional Study Area. Between 1970 and 1990, laborers, as a percent of the total labor force are expected to decline modestly in the Ohio Regional Study Area, whereas in the Pennsylvania Study Area they are expected to increase, given the industrial base and baseline outlook for each area. The remaining occupations in the Ohio Regional Study Area should exhibit the same basic distributions and patterns as those in the Pennsylvania Regional Study Area. Service-oriented occupations, on the average, should increase relative to those associated with manufacturing. In particular, clericals should exhibit the largest absolute increase, representing almost one-fifth of the Ohio Regional Study Area's workers by 1990, up from one-eighth in 1970.

Pennsylvania Regional Study Area

2.93
Estimates of the occupational distribution of the Pennsylvania Regional Study Area labor force are presented in Table 2-55. The data in the table depict the same basic trends and relative distributions as those highlighted above for the total Regional Study Area. Employment occupations associated with selected services, F.I.R.E., and wholesale/retail trade (service personnel, clericals, administrators and managers) are expected to exhibit the greatest relative increases.

Social Environment

Population

a) Regional Population Characteristics

Background

2.94
The States of Ohio and Pennsylvania are among the 10 most populous States in the nation, and have a combined population of almost 22.5

Table 2-54

Projected Occupational Distribution of Labor Force for the Ohio Regional Study Area

	1970		1990	
	Number of Employees	Percent	Number Employees	Percent
Professional, Technical, & Kindred	3,680	10.1%	5,925	12.0%
Administrators and Managers	3,570	9.8	5,630	11.4
Clericals	4,645	12.7	9,135	18.5
Salespersons	2,155	5.9	3,060	6.2
Craftsmen/Foremen	6,225	17.0	7,455	15.1
Operatives	9,975	27.3	9,235	18.7
Service Personnel	4,080	11.2	6,170	12.5
Laborers	2,230	6.0	2,765	5.6
Total:	36,560	100.0%	49,375	100.0%

Source: Arthur D. Little, Inc. estimates.

Table 2-55

Projected Occupational Distribution of Labor Force for the Pennsylvania Regional Study Area

	1970		1990	
	Number of Employees	Percent	Number of Employees	Percent
Professional, Technical & Kindred	17,025	12.6%	22,250	12.5%
Administrators and Managers	11,755	8.7	20,115	11.3
Clericals	21,210	15.7	32,930	18.5
Salespersons	9,185	6.8	10,860	6.1
Craftsmen/Foremen	22,830	16.9	25,630	14.4
Operatives	30,805	22.8	33,465	18.8
Service Personnel	15,265	11.3	24,030	13.5
Laborers	5,270	3.9	8,720	4.9
Not Classified	1,755	1.3	---	---
Total:	135,100	100.0%	178,000	100.0%

Source: Arthur D. Little, Inc. estimates.

million. The population in the Regional Study Area represents but a small percentage of total population in the two States. In fact, the total three-county area constituted only 2.0 percent of the 1975 combined populations of Ohio and Pennsylvania. The Ohio portion of the Regional Study Area accounts for less than one percent of that State's 1975 population, while the Pennsylvania portion represents about 3.0 percent of the State population. The total population of the Ohio and Pennsylvania Regional Study Area was 458,600 in 1975, as compared to 443,200 in 1970. Approximately 22 percent of the Regional Study Area population resided in Ohio, with the remainder in Pennsylvania. The proportion of study area population resident in each State remained essentially unchanged over the period 1970-1975 (refer to Table 2-56). The Ohio Regional Study Area is primarily rural with only one municipality, Ashtabula City, having a population greater than 20,000. The two counties in Pennsylvania also exhibit rural characteristics; however, Erie County is relatively more urbanized than the other counties in the overall Regional Study Area. The largest city in the Regional Study Area is Erie City, with a 1975 population of 124,000. Millcreek, also in Erie County, had a 1975 population of 39,000, and is the second largest municipality in the Regional Study Area. Erie City alone accounted for about 35 percent of the Pennsylvania Study Area population; and in combination with Millcreek, accounted for about 48 percent. In comparison with major Standard Metropolitan Statistical Areas (SMSA's) in the Great Lakes region, the Regional Study Area most closely approximates the Youngstown/Warren SMSA in size, based on 1975 population.

Growth

2.95
The average annual rate of population growth for Ohio and Pennsylvania combined over the 1960-1975 period was 0.5 percent with population increasing by over 1.5 million. Ohio registered a 0.7 percent average annual growth rate, while Pennsylvania with growth of about 540,000 averaged 0.3 percent annual growth, as shown in Table 2-57. For the Regional Study Area, population during this period increased by 36,900 persons, for an average annual rate of growth of 0.6 percent--slightly higher than the rate for the two States combined. The increase in population in the Local Study Areas combined accounted for 1.6 percent of the net gain in the Regional Study Area. Growth in the Local Study Area was primarily due to a 23 percent increase in population in the Pennsylvania Local Study Area over the 15-year period. Although the population of the Ohio Local Study Area was increased with its annexation of Lakeville Township in 1962, the population of Conneaut City by 1975 was equal to its 1960 level (refer to Table 2-58). Although rates of growth in the Pennsylvania Local and Principal Study Areas were higher than those in the Ohio Study Areas, Ashtabula County did experience a slightly higher rate

Table 2-56

Population Comparisons--1970-1975

Region	1970 Population (000s)	Percent	1975 Population (000s)	Percent
Total Study Area	443.2	100.0%	458.6	100.0%
Ohio Regional	98.2	22.2	102.0	22.2
Pennsylvania Regional	345.0	77.8	356.6	77.8
Percent of State[1]				
Total Ohio and Pennsylvania	22,445.9	2.0%	22,588.0	2.0%
State of Ohio	10,652.0	0.9	10,759.0	0.9
State of Pennsylvania	11,793.9	2.9	11,829.0	3.0
Percent of Great Lakes SMSAs				
Youngstown/Warren SMSA	536.0	82.7%	548.5	83.6%
Cleveland SMSA	2,064.2	21.5	1,975.4	23.2
Pittsburgh SMSA	2,401.3	18.5	2,315.9	19.8
Buffalo SMSA	1,349.0	32.9	1,327.2	34.6

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(1) Total Study Area as percent of total Ohio and Pennsylvania and Regional Study Area in each state as a percent of state population.

Source: U.S. Census of Population, General Population Characteristics, 1970; and Current Population Reports - Series P-25 U.S. Department of Commerce, Bureau of the Census.

Table 2-57

Population -- 1969-1975
(Thousands)

				Annual Average Growth Rate		
	1960	1970	1975	1960-70	1970-75	1960-75
Total Regional Study Area	421.7	443.2	458.6	0.5%	0.7%	0.6%
State of Ohio	9,706.4	10,652.0	10,759.0	0.9	0.2	0.7
State of Pennsylvania	11,319.4	11,793.9	11,829.0	0.4	0.1	0.3
Total Ohio and Pennsylvania	21,025.8	22,445.9	22,588.0	0.7	0.1	0.5
United States	180,671.0	203,304.9	213,032.0	1.2	0.9	1.1

Source: U.S. Census of Population, General Population Characteristics, 1960; 1970; and Current Population Reports - Series P-25, U.S. Department of Commerce, Bureau of the Census.

Table 2-58

Population Growth in the Regional Study Area (Thousands)

	1960	1970	1975	Average Annual Growth Rate 1960-70	1970-75	1960-75
Total Regional Study Area	421.7	443.2	458.6	0.5%	0.7%	0.6%
Ohio Regional	93.1	98.2	102.0	0.5	0.8	0.6
Pennsylvania Regional	328.6	345.0	356.6	0.5	0.7	0.5
Total Principal Study Area	305.2	321.0	331.3	0.5	0.6	0.5
Ohio Principal	70.4	72.8	75.0	0.3	0.6	0.4
Pennsylvania Principal	234.8	248.2	256.3	0.6	0.6	0.6
Total Local Study Area	17.3	17.6	17.9	0.2	0.3	0.2
Ohio Local	14.7(1)	14.6	14.7	-0.1	0.1	-0-
Pennsylvania Local	2.6	3.0	3.2	1.4	1.3	1.4

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(1) Includes the population of Lakeville Township which was annexed to Conneaut City in December, 1962.

Source: U.S. Census of Population, General Population Characteristics, 1960; 1970, and Current Population Reports - Series P-25, U.S. Department of Commerce, Bureau of the Census.

of growth during 1960-1975 than the overall average for the Pennsylvania Regional Study Area. The difference was due to a number of factors, including a higher rate of population growth in areas of Ashtabula County outside the Local and Principal Study Areas, and a lower rate of growth in Crawford County.

Composition of the Population

2.96
The distribution of population by sex in the total Regional Study Area is skewed slightly toward females. In the Regional Study Area, the population in 1975 was 51.5 percent female and 48.5 percent male. The proportion of females has increased slightly over time and in 1960, the composition for the three counties was 49.1 percent males, 50.9 percent female. The present sexual distribution of the population in the Regional Study Area, and the trend toward a higher percentage of females, are consistent with observed distributions and trends in the States of Ohio and Pennsylvania, and the nation as a whole. The population of the total Regional Study Area is virtually all white. In 1970, those persons classified as white made up 97.0 percent of the population in the three counties. Blacks constitute only 2.8 percent of the population, and all other groups were 0.2 percent. By way of comparison, the black populations in the two States of Ohio and Pennsylvania constituted 8.8 percent of the total population, and in combination with all other nonwhite groups, were 9.2 percent of total population.

2.97
A number of trends are evident in the age distribution of the population in the Regional Study Area. First, the percentage of the population in two age brackets--under five and the prime child-bearing years 25-35--showed declines over the period 1960-1970. These trends correlated with a decline in the area's birth rate. Second, population in the 10-24 year age bracket constituted a larger percentage of total population by 1970 resulting in a decline in median age for all three counties, from more than 30 years to about 28 years. Total land area in the Regional Study Area encompasses over 2,500 square miles, with a total population density in 1975 of only 181.6 people per square mile, an indication of the rural character of much of the area. Crawford County, with the largest land area, has the lowest population and therefore the lowest density. In Ashtabula County, the range of densities was from 26 per square mile in one of the rural townships, to 3,549 per square mile in Ashtabula City. Densities for each of the Regional Study Areas are presented in Table 2-59.

Table 2-59

Population Densities

Region	Land Area (Sq Mi)	Population Per Square Mile		
		1960	1970	1975
Total Regional Study Area	2,525.4	167.0	175.5	181.6
Ohio Regional	664.1	140.2	147.9	153.6
Pennsylvania Regional	1,861.3	176.5	185.4	191.6
State of Ohio	40,975.0	236.9	260.0	262.6
State of Pennsylvania	44,966.0	251.7	262.3	263.1

Source: Statistical Abstract, U.S. Department of Commerce, Bureau of the Census; the Ashtabula County Planning Commission; Erie County Metropolitan Planning Commission.

Components of Population Change

2.98
In Ashtabula County, there was a net out-migration of 3,203 during the period 1960-1970. The bulk of those leaving were young, in the age group 15-34; and over 60 percent of the out-migrants were males. Persons aged 20-24 constituted the largest group moving from the county. Although the average ratio of births to population (in thousands) dropped from an estimated 18.67 during the period 1960-1970, to an estimated 16.63 for the period 1970-1975 (based on end-of-period population and average annual births) the natural increase in the population, measured by the difference of births and deaths, equaled 3,163 during the latter period. In addition, there are indications of a reversal in the out-migration observed during the previous period, based on a net influx of 600 new residents during the period 1970-1975 (refer to Table 2-60). During the 15-year period, 1960-1975, population in the Pennsylvania Regional Study Area has increased by more than 27,900 persons. However, population growth has been due solely to natural increase, since there has been a constant out-migration during the period. For the period 1960-1970, the average annual out-migration was approximately 1,530 persons. This rate of out-migration was reduced in more recent years, with a total outflow of only 400 persons during the entire five-year period 1970-1975 as shown in Table 2-61.

b) Population Growth Trends

Ohio Local Study Area*

2.99
There has been virtually no growth in the population of the Ohio Local Study Area during the period 1960-1975. In fact, between 1960 and 1970, there was a net loss of more than 100 persons, or 1.4 percent of the 1960 population. Modest population growth between 1970 and 1975 restored population to the previous levels of 1960 (refer to Table 2-62). In 1960, the population of the Local Study Area resided in two municipalities: Conneaut City and Lakeville Township. The city annexed the township in 1962, thereby increasing the land area of the city, and its population by about 4,200 persons.** While the population of Conneaut has remained stable, other parts of Ashtabula County have experienced modest growth. As a result, the proportion of total county population in Conneaut has declined from 16 percent in 1960 to 14 percent in 1975.

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* Data on compontents of population change were not available for the Local and Principal Study Areas.

** For consistency, all 1960 population figures for Conneaut include Lakeville, unless otherwise indicated.

Table 2-60

Components of Population Change in the Ohio Regional Study Area -- 1960-1975[1]

Period	Births	Deaths	Net Migration	Total Change
1960-1970	18,330	9,957	-3,203	5,170
1970-1975	8,483	5,320	600	3,763
1960-1975	26,813	15,277	-2,603	8,933

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[1] Ashtabula County only. Data for other study areas, e.g., local area, were not available.

Source: Current Population Reports Series P-26, U.S. Department of Commerce, Bureau of the Census; and Ashtabula County Planning Commission.

Table 2-61

Components of Population Change in the Pennsylvania Regional Study Area -- 1960-1975[1]

Period	Births	Deaths	Net Migration	Total Change
1960-1970	66,768	35,128	-15,282	16,358
1970-1975	30,600	18,600	- 400	11,600
1960-1975	97,368	53,728	-15,682	27,958

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[1] Erie and Crawford Counties, Pennsylvania. Detailed data for other study areas, e.g., local study area, were not available.

Source: Current Population Reports Series P-26, U.S. Department of Commerce, Bureau of the Census.

Table 2-62

Population Growth Trends in the Local Study Areas

Location	Population (000's)			% Average Annual Growth		% of County Population		
	1960	1970	1975	1960-70	1970-75	1960	1970	1975
Ohio Local Study Area								
Conneaut	14.74	14.55	14.70	-0.1%	0.2%	15.9%	14.8%	14.4%
Pennsylvania Local Study Area								
Springfield Township	2.13	2.45	2.60	1.5	1.2	0.8	0.9	1.0
E. Springfield Borough	0.51	0.59	0.60	1.6	0.3	0.2	0.2	0.2
Total	17.38	17.59	17.90					

Source: U.S. Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census; Arthur D. Little, Inc. estimates.

Pennsylvania Local Study Area

2.100
Although population in Springfield Township and East Springfield Borough constitutes only 18 percent of the total in the Local Study Areas of Ohio and Pennsylvania combined, virtually all growth in the Local Study Areas has occurred in the two Pennsylvanian communities. Over the 15-year period, population increased by 23 percent in the Pennsylvania Local Study Area, principally through the growth of Springfield Township. From a level of 2,132 in 1960, population in the township increased to 2,600 in 1975, at an average annual rate of 1.4 percent. During the same period, East Springfield Borough increased in population from 511 to 605 persons, an average annual rate of 1.2 percent (refer to Table 2-62). In 1970, the Pennsylvania Local Study Area accounted for about 1.2 percent of the population of Erie County, and only 0.9 percent of the Pennsylvania Regional Study Area. This represented a slight increase over 1960, when the Local Study Area accounted for 1.05 percent of the Erie County population, and 0.8 percent of the population of Erie and Crawford Counties combined. Thus, there are indications that, although the Local Study Area constitutes a fraction of the Regional Study Area population, it is slowly outpacing it in population growth. The source of the more rapid rate of growth (i.e., the natural increase through higher birth rate, lower mortality, and/or higher migration into the area), cannot be clearly established, since the necessary data are not disaggregated below the county level.

Ohio Principal Study Area

2.101
In 1960, the population of the Coastal Communities of the Principal Study Area represented almost 45 percent of the population of Ashtabula County. By 1975, the proportion of the population located in these communities had declined to less than 43 percent. Whereas the county experienced an increase of 5.5 percent in its population during the 10-year period, 1960-1970, the Coastal Communities registered growth of only 2.1 percent. This lower rate of growth was due largely to a 1.2 percent drop in the population of Ashtabula City. The townships of Kingsville (including North Kingsville Village), Saybrook, and Ashtabula all recorded gains, as shown in Table 2-63. In contrast, some communities in the Principal Study Area outside of the Coastal Communities experienced significantly higher rates of growth between 1960 and 1970. The population of Plymouth Township increased by more than 40 percent during this period. Bordering Ashtabula Township to the south, Plymouth may have absorbed some of the out-migration from Ashtabula City. Other outlying communities, including Andover, Monroe, and Sheffield all experienced growth of more than 10 percent during the period. In

Table 2-63

Population Growth Trends in the Principal Study Areas -- 1960-1975
(Thousands)

Coastal Communities	1960		1970		1975	
	Population	% of County[1]	Population	% of County[1]	Population	% of County[1]
Ohio						
Ashtabula Township	7.1	7.6%	7.4	7.5%	7.6	7.5%
Ashtabula City	24.6	26.4	24.3	24.7	24.3	23.8
Kingsville Township	3.7	4.0	4.2	4.3	4.7	4.6
Saybrook Township	6.2	6.7	6.6	6.7	6.7	6.6
	41.6	44.7%	42.5	43.2%	43.3	42.5%
Pennsylvania						
Fairview (Township and Borough)	5.3	2.2	8.0	3.0	8.5	3.1
Girard Area[2]	6.9	2.8	8.1	3.0	8.8	3.2
Millcreek Township	28.4	11.3	36.9	14.0	39.0	14.4
	40.6	16.3%	53.0	20.0%	56.3	20.7%

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(1) Ashtabula in Ohio; Erie in Pennsylvania.

(2) Includes Girard Township, Girard Borough, Lake City and Platea.

Source: U.S. Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census.

general, the townships grew at a faster average annual rate than the cities and villages or 0.8 percent per year as opposed to 0.3 percent per year. Of the net population increase in the Regional Study Area of 5,170 persons over the period, the townships accounted for 65 percent of the total increase, although representing less than 50 percent of the total county population. Thus, there are indications that the rural portions of the county are growing faster than the more urbanized coastal belt.

Pennsylvania Principal Study Area

2.102
The Pennsylvania coastal communities of the Principal Study Area accounted for 20 percent of the Erie County population in 1970 as opposed to 16.3 percent in 1960. This change in the proportion of the population resident in the coastal area west of Erie City was stimulated largely by the growth of Millcreek, which increased its population by 30 percent over the period 1960-1970. Between 1970 and 1975, the rate of growth in Millcreek slowed sharply, over the five-year period, with net growth totaling only 5.6 percent. Other municipalities in the Pennsylvania Coastal Communities also demonstrated sharp growth in population. Fairview Township and Borough, for example, grew by over 2,500 persons, or 51 percent, between 1960 and 1970, while Lake City increased in population by 23 percent. Although rates of growth generally slowed for many of the Coastal Communities in the 1970-1975 period, population levels continued to increase as shown in Table 2-63. Between 1960 and 1970, the average annual rate of growth in population for Erie County was 0.52 percent with a net increase of approximately 13,000. Over the five-year period, 1970-1975, the rate of growth dropped to 0.31 percent per year. In Crawford County, the rate of growth also decreased during the period 1970-1975, but not as markedly as in Erie County. Between 1960-1970, the average annual rate of increase in population was 0.44 percent. During the period 1970-1975, the average rate was 0.43 percent per year.

c) Characteristics of the Population

Distribution of the Population by Sex

Ohio Local Study Area

2.103
In 1960, the population of the Ohio Local Study Area was composed of 49.2 percent males and 50.8 percent females. This distribution represented a slight variance from the overall sex distribution of Ashtabula County, which consisted of 49.7 percent males and 50.3 percent females. During the period 1960-1970, the distribution became

more weighted in favor of females, who comprised 52.3 percent of the Local Study Area population in 1970, as compared to the 47.7 percent male population.

Pennsylvania Local Study Area

2.104
The distribution of the population in the Pennsylvania Local Study Area consisted of 51.0 percent males and 49.0 percent females in 1960. By 1970, there had been a slight shift in the distribution to 51.4 percent males and 48.6 percent females. This was divergent from trends observed in the Regional Study Area, for example, whose composition was 48.9 percent male and 51.1 percent female in 1960, but with a trend toward an increasing proportion of females 51.7 percent in 1970. Table 2-64 presents the sex distribution of the populations for the Ohio and Pennsylvania Study Areas.

Ohio Principal Study Area

2.105
As in the Local Study Area, the proportion of females in Ashtabula County increased from 50.3 percent in 1960 to 51.2 percent in 1970. The net increase for the county was 3,549 females, as opposed to 1,711 males. Among the Coastal Communities, all but Kingsville Township were similar to the general composition of the county, with the number of females exceeding the number of males. In 1960, males comprised 53.5 percent of the population of Kingsville Township, but this proportion declined by 1970 to 51.1 percent. The overall distribution for the Coastal Communities is presented in Table 2-64. For the entire Principal Study Area, the proportion of females in the population increased by one percentage point, from 50.5 percent to 51.5 percent, with a corresponding drop in the relative population of males.

Pennsylvania Principal Study Area

2.106
Reflecting the overall composition of the county, the coastal townships and boroughs had populations consisting of more females than males, as shown in Table 2-64. However, there has been a change in the composition within several communities, with the male population declining relative to the female population. In 1960, three of the five townships and boroughs which comprise the Pennsylvania Coastal Communities had populations consisting of 50 percent males. For the Coastal Communities as a whole, the male proportion of the population was 49.9 percent. By 1970, females out-numbered males in all of the Coastal Communities, and the male proportion of the population had dropped to 49.2 percent.

Table 2-64

Population by Sex in the Regional Study Area -- 1960-1970

Region	1960 (000)	1960 Males (000)	1960 %	1960 Females (000)	1960 %	1970 Total (000)	1970 Males (000)	1970 %	1970 Females (000)	1970 %
Ohio										
Local Study Area	14.74	7.26	49.2%	7.48	50.8%	14.55	6.94	47.7%	7.61	52.3%
Coastal Communities	41.59	20.51	49.3	21.08	50.7	42.47	20.53	48.3	21.94	51.7
Principal Study Area	70.37	34.81	49.5	35.56	50.5	72.81	35.31	48.5	37.50	51.5
Regional Study Area	93.07	46.26	49.7	46.81	50.3	98.23	47.97	48.8	50.26	51.2
Pennsylvania										
Local Study Area	2.64	1.35	51.0	1.29	49.0	3.04	1.56	51.4	1.48	48.6
Coastal Communities	38.61	19.26	49.9	19.35	50.1	50.50	24.85	49.2	25.65	50.8
Principal Study Area	234.79	114.93	49.0	119.86	51.0	248.17	119.91	48.3	128.26	51.7
Regional Study Area	328.64	160.92	48.9	167.72	51.1	345.00	166.70	48.3	178.30	51.7

Source: *Census of Population, General Population Characteristics, 1970*, U.S. Department of Commerce, Bureau of the Census.

Distribution of the Population by Ethnic Group

Ohio Local Study Area

2.107
In 1970, 99.1 percent of the population of the Ohio Local Study Area was classified by the Bureau of Census as white, and 0.9 percent was classified in a racial group other than white. Blacks accounted for almost three-fourths of all racial minorities in the Local Study Area, but represented only 0.6 percent of the Local Study Area population. Total count for racial minorities in the Local Study Area in 1970 was 130 persons. The net growth for the minority group over the 1960-1970 period was 16 persons which was due to an increase in the nonblack sector of the minority group. However, there was a net decrease in the black population, from 103 persons in 1960 to 95 in 1970. (Data for 1975 were not available.)

Pennsylvania Local Study Area

2.108
In the Pennsylvania Local Study Area, the minorities represented 1.3 percent of the total population or 39 persons in 1970. Of these, 33 were black residents in Springfield Township.

Ohio Principal Study Area

2.109
Minority representation in the Ohio Principal and Regional Study Areas, while greater than in the Local Study Area, is still small. In 1970, only 2.6 percent of the Ashtabula County residents were blacks, yet they constituted the largest single minority group. In the county as a whole, there were about 2,500 blacks while the total remaining minorities numbered 213 persons, or 0.2 percent of county population. Ashtabula City, with a black population of almost 1,600 persons, accounted for over 60 percent of all minorities in the county.

Pennsylvania Principal Study Area

2.110
Minority representation in the Pennsylvania Principal Study Area is marginal, and in some communities (e.g., Fairview Borough) nonexistent, according to 1970 data. The largest of the Coastal Communities, Millcreek, had a minority population of less than 0.5 percent of its total population. Few of the municipalities in Erie County outside of Erie City have any minority population. Total minority population for the county in 1970 was 9,471 with 93 percent residing in Erie City.

Distribution of the Population by Age

Ohio Local Study Area

2.111
Data indicate that the population of the Ohio Local Study Area tends generally to be an older group than populations elsewhere in the Ohio Regional Study Area. For 1970, the percentage of persons in the Local Study Area under 18 years of age was 34.5 percent, the second lowest in the county. The group of persons aged five to 65 constituted a higher proportion of the population relative to the county, while the population under five declined as a percentage of Local Study Area population between 1960 and 1970 (refer to Table 2-65). At the same time, median age in the Local Study Area was the second highest in the county, at 30.8 years. This was significantly higher than median age for both the county and Ohio. However, there was a drop in the median age when compared to the level reported in 1960 for the city of Conneaut (median age for 1960 excludes Lakeville Township), reflecting changes in the composition of the population as a result of growth through annexation, and population increases in the 15-24 year age bracket relative to the total.

Pennsylvania Local Study Area

2.112
The population in the Pennsylvania Local Study Area in 1970 had a median age of approximately 26 years. The proportion of the population under 18 years was approximately 40 percent, while the percentage over 65 years was about nine percent, two factors which contributed to the significantly lower median age in comparison to the Ohio area. Due to the small size of Local Study Area population, limited data availability restricts more detailed description of the age characteristics of the local population (refer to Table 2-66).

Ohio Principal Study Area

2.113
The age distribution of the communities of the Ohio Principal Study Area in many respects accurately reflects the composition of Ashtabula County. The percentages of the population within each age group for the Principal Study Area were generally within a small variance from the age distribution by group for the county as a whole, as shown in Table 2-65. As in Conneaut, the median age in the county as a whole declined in 1960, and in 1970 was reported at 28.4 years. The change in median age is again attributed to growth in the proportion of the population aged 15-24.

Table 2-65

Age Distribution of Population in the Ohio Regional Study Area -- 1960 and 1970
(Percentage in Age Category)

	0-5	6-14	15-24	25-65	65+	Median Age
1960 Ohio						
Local Study Area	12.1%	16.8%	11.6%	47.4%	12.1%	33.7%[1]
Principal Study Area	11.3	20.8	11.8	46.2	9.9	N/A
Regional Study Area	13.7	18.6	12.0	45.5	10.2	33.0
1970 Ohio						
Local Study Area	11.0	17.5	15.0	45.0	11.5	30.8
Principal Study Area	11.2	18.8	16.0	44.0	10.0	28.5
Regional Study Area	10.9	19.2	15.8	43.9	10.2	28.4

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[1] Excludes Lakeville Township.

Source: Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census.

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Table 2-66

Age Distribution of Population in the Pennsylvania Regional Study Area -- 1960 and 1970 (Percentage in Age Category)

1960 Pennsylvania	0-5	6-14	15-24	25-65	65+	Median Age
Local Study Area	13.4%	21.3%	13.0%	43.3%	9.0%	N/A
Principal Study Area	11.7	20.3	12.3	46.3	9.4	N/A
Regional Study Area	11.4	15.2	12.8	50.7	9.9	30.4
1970 Pennsylvania						
Local Study Area	9.4	28.3	11.7	41.6	9.0	26.1
Principal Study Area	8.7	20.5	17.2	43.8	9.8	28.0
Regional Study Area	8.8	20.4	17.3	43.6	9.9	28.4

Source: Census of Population, General Population Characteristics, 1960 and 1970, U.S. Department of Commerce, Bureau of the Census.

Pennsylvania Principal Study Area

2.114
In the Pennsylvania Principal Study Areas similar trends can also be observed. For example, the proportion of the population in the 15-24 year age group increased over levels of 1960. However, the population under five years declined from 11.7 percent in 1960 to 8.7 percent in 1970, due to the decline in the birth rate during the period. At the county level, median age fell from 30.0 years in Erie County in 1960 to 27.7 years in 1970, and in Crawford County from 30.8 years to 29.1 years.

d) Population Density

Ohio Local Study Area

2.115
The city of Conneaut encompasses a land area of 27.4 square miles which, based on 1970 population, supports a population density of 531 persons per square mile. However, of the total land area, roughly 23 percent is classified as "developed area" (including single-, two-family, multifamily, and seasonal residence, commercial, and other land area) with 77 percent designated "vacant area" (including principally agricultural lands). Population density on the 6.29 square miles of developed land area is about 2,313 persons per square mile. On the basis of total land area, Conneaut ranks sixth among the communities of Ashtabula County in terms of population density. However, density per square mile on the developed sector of land is second only to Ashtabula City (refer to Table 2-67).

Pennsylvania Local Study Area

2.116
The Pennsylvania Local Study Area covers 37.8 square miles and supported a population density of 80.4 persons per square mile, based on 1970 population (see Table 2-67). The most densely populated sector of the study area was East Springfield Borough, with 118 persons per square mile. For Springfield Township, the density in 1970 was 74.7 persons per square mile.

Ohio Principal Study Area

2.117
The population densities in Ashtabula County range from 3,549 per square mile in Ashtabula City to 259 per square mile in the village of North Kingsville. The southern, rural portions of the county typically have population densities of between 25 and 100 per square

Table 2-67

Population Densities in Selected Municipalties in Ashtabula and Erie Counties

Ohio			Pennsylvania		
Municipalities	Area (Sq Mi)	Density (1970)	Municipalities	Area (Sq Mi)	Density (1970)
Ashtabula City	6.8	3549	Millcreek Township	33.7	1095
Conneaut City	27.4	531	Fairview Township and Borough	28.6	279
North Kingsville Village	8.4	259	Girard Township and Borough	33.0	169
Saybrook Township	31.4	200	Springfield Township and E. Springfield Borough	37.8	80.4

Source: Land Use and Zoning, Conneaut City Planning Commission, C. Hill and Associates, Columbus, Ohio, 1965.

Land Use - Ashtabula City, Ashtabula County Planning Commission, 1972.

Land Use Update Report, Erie County Metropolitan Planning Commission, 1972.

Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census.

mile, with the townships of the coastal belt having greater densities. Saybrook Township, with 200 per square mile, is an example of the latter.

Pennsylvania Principal Study Area

2.118
The Coastal Communities of the Pennsylvania Principal Study Area occupy an area of 95.3 square miles and in 1970 had a population density of 529 per square mile. The most densely populated Coastal Community is Millcreek, with 1,095 people per square mile. Population densities in other parts of Erie County generally reflect the rural character of most portions of the Pennsylvania Regional Study Area. Conneaut and Elk Creek Townships, each with a high proportion of land zoned for agricultural use, have densities of 43 and 41 per square mile, respectively.

e) Households

Ohio Local Study Area

2.119
In the 10-year period, 1960-1970, there was modest growth in the number of households in the Ohio Local Study Area. With an increase of 174 occupied housing units during the period, the average annual rate of increase in the number of households was 0.4 percent per year. At the same time, household size decreased, from 3.19 persons per household to 3.04 as shown in Table 2-68. The decrease in household size may be attributed to a number of factors, including the decline in population during the period. Between 1970 and 1975, the number of households grew at a much faster rate than the population, 1.6 percent per year for households, as opposed to 0.2 percent for population. There was an increase of 387 occupied housing units during the period. Coupled with the rise in the number of households was the continued decline in the number of persons per household, which reflects the increasing proportion of single person or childless couple households. In 1970, about 64 percent of the heads of households were aged 45 years or older, with heads over 65 accounting for almost one-quarter of all household heads. Persons under 35 years of age accounted for less than 20 percent of all household heads (refer to Table 2-69). In general, household heads in the Local Study Area tended to be older than was observed at the county and State levels. Male heads of households (including those living alone) accounted for 79 percent of all household heads. Primary individuals, i.e., persons living alone or with nonrelatives, accounted for about 20 percent of household heads. Females accounted for 73 percent of the 948 primary individuals in 1970. Median income in 1970 was $9,595, well below the 1970 Ohio

Table 2-68

Households in Ohio

	Number of Households			People Per Household		
	1960	1970	1975	1960	1970	1975
Conneaut City	4,615(1)	4,789	5,176	3.19	3.04	2.84
Kingsville Township and Village	932	1,168	1,403	3.98	3.58	3.35
Ashtabula Township	2,123	2,339	2,568	3.33	3.16	2.96
Ashtabula City	7,401	7,608	8,127	3.32	3.20	2.99
Saybrook Township	1,846	2,017	2,198	3.38	3.26	3.05
Ashtabula County	27,173	29,953	33,225	3.42	3.28	3.07

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(1) Includes Lakeville Township

Source: Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census.

Table 2-69

Distribution of Households by Age of Head of Household in the Ohio Regional Study Area

	Percentage of Households by Age of Head				
	14-24 Years	25-34 Years	35-44 Years	45-64 Years	65+ Years
1970 Ohio					
Local Study Area	5.4%	14.0%	16.7%	40.1%	23.8%
Principal Study Area (1)	6.3	15.7	16.7	38.5	22.8
Regional Study Area	5.9	16.4	18.1	39.1	20.5

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(1) Principal Study Area estimated by using data for cities of Ashtabula and Conneaut (57% of the area's households) - no data available for townships.

Source: Census of Population, General Population Characteristics, 1970, U.S. Department of Commerce, Bureau of the Census.

median income of $10,313 (refer to Table 2-70). During the same year over 50 percent of the families in the Local Study Area had an income of $10,000 or less.

Pennsylvania Local Study Area

2.120
The total number of households in the Pennsylvania Local Study Area was 875 in 1970, while in 1975 there were an estimated 991 households in this area. Between 1960 and 1970, the number of households increased by 18 percent, a slightly higher increase than that for population. The average number of persons per household is higher in the Pennsylvania Local Study Area than in Ohio. In 1960, the average was 3.56, and in 1975, 3.23 (refer to Table 2-71). There are proportionally fewer primary individuals in the Pennsylvania Local Study Area than the Ohio Local Study Area.

Ohio Principal Study Area

2.121
The total increase in the number of households in Ashtabula County between 1960 and 1970 was 2,780, based on the number of occupied housing units. With the number of households increasing at a faster rate than population, the number of persons per household dropped from an average of 3.42 to 3.28. At the same time, the number of households which were families dropped five percent from 87 percent to 83 percent of all households. For 1975, it was estimated that the number of households had increased to over 33,000 and the average number of persons per household had dropped sharply, to an estimated 3.07 (refer to Table 2-68). Coastal Communities accounted for 45 percent of all households in 1960 and 43 percent in 1975, indicating a faster rate of growth in the proportion of households outside of the coastal area. There were over 14,000 households in the Coastal Communities in 1975. The proportion of household heads aged 45 years and older was less in the Regional Study Area than in the Local Study Area, and there was a corresponding higher proportion of younger household heads in Ashtabula County as a whole. In particular, household heads aged 25-44 constituted more than one-third of all household heads in the county. Similarly, household heads aged 25-44 constituted about one-third of all household heads in the Principal Study Area. While the Principal Study Area had a smaller proportion of heads aged 45-64, there were proportionally more heads of households under 25 than in the Local Study Area or the county as a whole. Median income was highest at the county level, as shown in Table 2-70, while median income in the Principal Study Area was less than in the Local Study Area. For all study areas, median income was below State levels.

Table 2-70

Distribution of Families by Income(1) in the Ohio Regional Study Area

	Percentage by Family Income Class						
	$0-10,000	$10,000-15,000	$15,000-20,000	$20,000-25,000	$25,000-50,000	$50,000	Median Family Income
1970 Ohio							
Local Study Area	53.4%	33.6%	------ 11.6%------		1.1%	0.3%	$9,595
Principal Study Area(2)	54.0	31.6	------ 12.4 ------		1.7	0.3	9,566
Regional Study Area	50.9	31.8	------ 14.3 ------		2.6	0.4	9,894
1960 Ohio							
Local Study Area	87.8	10.4	------ 1.6 ------		--------0.2-------		5,534
Principal Study Area(2)	87.5	9.8	------ 2.3 ------		--------0.4-------		5,625
Regional Study Area	88.5	8.9	------ 2.1 ------		-------0.5-------		5,651

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(1) Family income used, since data for households was available only for 1970; 84% of Ashtabula County's households were families.

(2) Estimated by using data for cities of Ashtabula and Conneaut - no data available for townships.

Source: Census of Population, Detailed Characteristics, U.S. Department of Commerce, Bureau of Census.

Table 2-71

Households in Pennsylvania

	Number of Households			People Per Household		
	1960	1970	1975	1960	1970	1975
Springfield Township and E. Springfield Borough	742	875	991	3.56	3.47	3.23
Girard Area	2,042	2,452	2,839	3.41	3.33	3.10
Girard Township and Borough	1,439	1,718	N/A	3.39	3.31	N/A
Lake City	509	631	N/A	3.38	3.35	N/A
Platea	94	103	N/A	3.80	3.44	N/A
Fairview Township and Borough	1,378	2,071	2,374	3.84	3.85	3.58
Millcreek Tonwship	8,009	10,898	12,381	3.55	3.39	3.15
Regional Study Area	95,879	104,433	116,156	3.43	3.30	3.07
Erie County	72,821	79,249	88,145	3.44	3.33	3.10
Crawford County	23,058	25,184	28,011	3.38	3.23	3.00

N/A = Not Available.

Source: 1960-79 Census of Population, U.S. Bureau of the Census; and Arthur D. Little, Inc. estimates.

Pennsylvania Principal Study Area

2.122
Between 1960 and 1970, there was an increase of about 4,000 households in the Pennsylvania Coastal Communities, largely due to the growth in Millcreek Township during that period. The Coastal Communities accounted for 62 percent of the growth in Erie County, and almost 50 percent of the growth in households in the Regional Study Area as shown in Table 2-71. Average household size has also been decreasing in the Regional Study Area since 1960. There was a slightly higher proportion of younger household heads in the Pennsylvania Regional Study Area as compared to its counterpart in Ohio. Over 41 percent of household heads in Erie County were under 45 years of age in 1970, as compared to about 40 percent in Ashtabula County. At the same time, the percentage of heads aged 65 years and over was lower in Erie County than either Ashtabula or Crawford County, and there were slightly more heads aged 45-64 in Erie than the other study areas. Median income for Erie County in 1970 was $9,363. Certain of the Coastal Communities (e.g., Girard and Fairview) had higher median income. Data indicate that outside of Erie City and the urbanized area, median incomes were closer to, and probably higher than the State median income for families of $9,558. In Erie City, family median income was less than $10,000, but data were not available to provide a detailed breakdown for other parts of the county.

f) Educational Attainment

Ohio Local Study Area

2.123
From 1960 to 1970, there was an improvement in the average level of education attained by the Local Study Area population. The number of persons 25 years old and over who had attended high school by 1970 had increased by 53 percent over the levels of 1960. The number completing four years or more of college increased 45 percent, and median years of school completed rose from 11.0 years to slightly more than 12. During the same period, the population 25 years old and over increased by 30 percent, which indicates that an increasing proportion of the population is receiving more education than previously. Data on educational attainment in the Ohio Local Study Area is presented in Table 2-72.

Ohio Principal Study Area

2.124
Of the more than 13,000 persons aged 25 and over in Ashtabula City, 50.4 percent completed four years of high school, or had gone on to

Table 2-72

Educational Attainment of Population 25 Years and Over in the Ohio Regional Study Area -- 1960-1970

	No School Completed	Elementary School 1-8 Yrs.	High School 1-4 Yrs.	College 1-3 Yrs.	College 4 Yrs. or More	Total Population 25+ Yrs.	Median Years Completed
1970 Ohio							
Local Study Area	73	1,827	5,465	432	405	8,202	12.1
Principal Study Area[1]	271	4,941	13,423	1,389	1,224	21,248	12.0
Regional Study Area	595	12,028	33,887	3,706	2,918	53,134	12.0
1960 Ohio							
Local Study Area	112	1,951	3,577	394	279	6,313	11.0
Principal Study Area[1]	377	6,478	10,941	1,361	961	20,118	11.0
Regional Study Area	699	16,613	28,669	3,605	2,182	51,768	11.2

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(1) Estimated by using Ashtabula and Conneaut - no data available for townships.

Source: Detailed Characteristics, Census of Population, U.S. Department of Commerce, Bureau of the Census.

college by 1970. Median school years completed was 12 (slightly less for males than females). Less than 200 persons in the 25 and over age category had no years of school completed. No data were available for other Coastal Communities. However, in 1970 data for Ashtabula County shows that, of the 53,134 persons aged 25 and over in 1970, 51.9 percent completed four years of high school or some level of higher education, with 12.5 percent having one or more years of college. There was a higher percentage of female high school graduates than male, and median years of school completed was 12. Less than 600 persons had no schooling at all.

Pennsylvania Principal Study Area

2.125
Of the more than 184,000 persons aged 25 and over in the Pennsylvania Regional Study Area, 57.7 percent, or 107,000 persons, had completed four years of high school or more in 1970. For Erie County, the percentage of high school graduates (58.3 percent) was slightly higher than for the region as a whole. Median years of school completed, for the region and for each county, was 12.2 years, indicating that the level of education attained in the Pennsylvania area was slightly higher than that in Ohio. This may be attributed in part to the greater number of institutions of higher education in the Pennsylvania Regional Study Area. Data on educational attainment in the Pennsylvania Principal Study Area is presented in Table 2-73.

g) Projections of Population and Households

Regional Study Area Summary

2.126
Baseline population projections for the total Regional Study Area between 1975 and 1990 are shown in Table 2-74. During this period, population in the Regional Study Area is expected to increase 10.4 percent from 458,600 in 1975 to 506,200 by the year 1990. Population growth in the Pennsylvania Regional Study Area (Crawford and Erie Counties) is estimated to exceed that in the Regional Study Area of Ohio by 11.2 percent and 7.6 percent, respectively. As a result, the Pennsylvania Regional Study Area will contain 78.3 percent of the total Regional Study Area population in 1990, up from 77.8 percent in 1975. The Principal Study Area in both States should grow at a somewhat slower rate than the Regional Study Area. Between 1975 and 1990, population growth in the Principal Study Area is expected to total 9.5 percent compared to the Regional Study Area growth of 10.4 percent. The State components of the Principal Study Area will maintain roughly the same proportions as in the Regional Study Area with the Pennsylvania side growing faster than the Ohio side (10.8 percent versus 5.3 percent). The total Local Study Area is expected to grow

Table 2-73

Educational Attainment of Population 25 Years and Over in the Pennsylvania Regional Study Area -- 1960-1970

	No School Completed	Elementary School 1-8 Yrs.	High School 1-4 Yrs.	College 1-3 Yrs.	College 4 Yrs. or More	Total Population 25+ Yrs.	Median Years Completed
1970							
Erie County	1,328	27,951	85,967	12,673	12,409	140,328	12.2
Crawford County	227	9,876	27,435	3,875	3.177	44,590	12.2
1960							
Erie County	2,456	44,939	72,384	10,129	8,864	138,772	11.4
Crawford County	423	15,522	21,637	3,575	2,465	43,622	11.5

Source: Detailed Characteristics, Census of Population, U. S. Department of Commerce, Bureau of the Census.

Table 2-74

Baseline Population and Household Projections in the Regional Study Area

Population	1975	1980	1985	1990	Average Annual Percent Increase 1975-90
Total Local Study Area	17,900	18,450	19,175	19,800	0.7%
Ohio Local Area	14,700	15,050	15,450	15,800	0.5
Pennsylvania Local Area	3,200	3,400	3,725	4,000	1.5
Total Principal Study Area	331,300	341,050	352,000	362,900	0.6
Ohio Principal Area	74,950	76,150	77,700	78,900	0.4
Pennsylvania Principal Area	256,350	264,900	274,300	284,000	0.7
Total Regional Study Area	458,400	475,200	490,700	506,200	0.7
Ohio Regional Area	102,000	104,400	107,300	109,800	0.5
Pennsylvania Regional Area	356,400	370,800	383,400	396,400	0.7
Households					
Total Local Study Area	6,087	6,706	7,333	7,724	1.6
Ohio Local Area	5,176	5,595	6,059	6,320	1.3
Pennsylvania Local Area	991	1,111	1,284	1,404	2.3
Total Principal Study Area	107,511	117,035	127,697	134,072	1.5
Ohio Principal Area	24,816	26,625	28,672	29,662	1.2
Pennsylvania Principal Area	82,695	90,410	99,025	104,410	1.6
Total Regional Study Area	149,381	163,302	177,781	186,790	1.5
Ohio Regional Area	33,225	35,879	38,868	40,517	1.3
Pennsylvania Regional Area	116,156	127,423	138,913	146,273	1.5

Source: Northern Ohio Urban Systems Research Corporation; and Pennsylvania Office of State Planning and Development.

from 17,900 in 1975 to 19,800 in 1990. This represents a growth rate of 10.6 percent, which is higher than that for the Regional and Principal Study Areas. The Pennsylvania Local Study Area, considerably smaller than the Ohio Local Study Area, is expected to achieve the highest growth rate (25 percent) during the 15-year period. However, the Ohio Local Study Area will continue to dominate the two-State Local Study Area, based on its proportion of the population. By 1990, it is estimated that there will be over 185,000 households in the Regional Study Area, an increase of 25 percent over the number of households in 1975. The number of households is projected to increase at a faster rate than the population because average household size will decrease over the forecast period.

Ohio Regional Study Area

Background

2.127

Population forecasts for the Ohio Regional Study Area were developed from data base of the 1970 Census of Population published by the U.S. Department of Commerce, Bureau of the Census, and supplemented by more recent population reports for 1975. Methodologies, specified below, used to generate the forecasts were drawn from a number of sources. Bureau of the Census data and assumptions concerning fertility rates and rates of natural increase were incorporated into the forecasts of population increase and the components of population change. Data provided by the Northern Ohio Urban Systems Research Corporation (NOUS) were also used in developing forecasts. Projections of population change prepared by the Ashtabula County Planning Commission were used as input for the forecasts developed for the Principal and Local Study Areas. Specifically, the shares of total county population which the Principal and Local Study Areas would represent as projected by the County Planning Commission were used to distribute the population below the county level.

Methodology and Assumptions

2.128

The Regional Study Area population forecasts assume a fertility rate of approximately 1.7 children per woman (the present standard used by the U.S. Bureau of the Census) and a net out-migration of 100 people per year. The low fertility rate seems reasonable, given: 1) the increasing economic costs of child raising, 2) the increasing participation of women in the labor force, 3) changes in lifestyle and attitudes towards marriage and family size, and 4) greater availability of family planning methods. The forecast of a modest net out-migration of 100 people per year is based on the expectation that there will continue to be in-migration into western Ashtabula

County of working age migrants and their families seeking a rural residential environment. This will almost offset an historical pattern of net out-migration of the younger working age population. It is expected that the out-migration of the young adults for higher education and of the elderly for retirement or health reasons will continue. It should be noted that the rate of net migration in a relatively small county such as Ashtabula could vary significantly. Plant openings and closings by single firms can have a marked impact on small counties. However, such events cannot be predicted with any accuracy. Since Ashtabula County experienced an average net out-migration of 177 people per year from 1960 to 1975, a forecast of an out-migration of 100 people annually appears to be reasonable. The population forecasts for Ashtabula County were disaggregated into their components of population change based upon national data published by the U.S. Department of Commerce, Bureau of the Census in Projections of the Population of the United States: 1975-2050, Current Population Reports Series P-25, No. 601, October 1975. The national projections, as noted, assume a fertility rate of 1.7 children per woman. In fact, these projections indicate a slight decline in the fertility rate over the 1975-1990 period. The fertility rate is defined as the average number of births per woman aged 10-49 years. The Bureau of the Census projections also indicate increasing birth rates among women in the 20-29 age group over the 1975-1990 period. However, since the share of all women of child bearing age in the 20-29 group is projected to decline, the overall effect will be a slight decrease in the fertility rate. At the same time, the average life expectancy is expected to increase. Projections for Ashtabula County indicate that the share of the population in the 65 and over age group will increase at an average annual rate of 1.1 percent over the 1975-1990 period. The annual increase in the death rate over the same period is expected to be only 0.7 percent. These assumptions along witn the migration estimates described earlier form the basis of the population forecasts of Ashtabula County (refer to Tables 2-75 and 2-76). It should be noted that assumptions concerning national net migration and fertility rates were chosen to present a conservative (low) population baseline projection and so that worst case impacts associated with the proposed Lakefront Plant could be developed. If baseline population levels were higher than those described in this section, population impacts attributable to the plant would be less significant relative to total baseline population and to baseline population growth rates. The historical level of net out-migration from Ashtabula County during the 1960-1970 period ran at an annual rate of about 320 persons. During the 1970-1975 period, the county experienced net in-migration of 120 persons per year. If in-migration were to occur at the 1970-1975 rate over the course of the projection period, rather than the modest out-migration assumed in these forecasts, total county population in 1990 would be 113,110, or three percent above

Table 2-75

Components of Population Change in Ashtabula County

	Net Change	Natural Increase	Births	Deaths	Net Migration
1970-1975	3,800	3,200	8,500	5,300	600
1975-1980	2,409	2,909	7,900	4,991	- 500
1980-1985	2,868	3,368	8,606	5,238	- 500
1985-1990	2,523	3,023	8,526	5,503	- 500

Source: Arthur D. Little, Inc. estimates.

Table 2-76

Population Projections for the Ohio Regional Study Area

	1975	1980	1985	1990	Percent Change 1975-90	Average Annual Rate of Growth(%) 1975-90
Regional Study Area	102,000	104,400	107,300	109,800	7.6%	0.5%
Principal Study Area	74,950	76,150	77,700	78,900	5.3	0.4
Coastal Communities	43,300	43,900	44,550	45,100	4.2	0.3
Kingsville Township and Village	4,700	5,150	5,600	6,050	2.9	1.7
Ashtabula Township	7,600	7,900	8,200	8,500	11.8	0.7
Ashtabula City	24,300	23,450	22,600	21,650	-10.9	-0.8
Saybrook Township	6,700	7,400	8,150	8,900	32.8	1.9
Local Study Area	14,700	15,050	15,450	15,800	7.5	0.5

Source: Arthur D. Little, Inc. estimates based on data provided by Northern Ohio Urban System Research Corporation, and U.S. Department of Commerce, Bureau of the Census.

the 1990 projected level of 19,800. Total population growth over the 15-year period would be 10.9 percent rather than 7.6 percent, or 0.7 percent rather than 0.5 percent per year. The fertility rate of 1.7 children per woman represents the lowest of three population projection series published by the Bureau of the Census (Series III). Use of the Series I rate (2.7 children per woman) would imply about 9,400 additional births in the Regional Study Area between 1975 and 1990 and an overall population growth of 16.9 percent. Series II (2.1 children per woman) would result in about 3,775 additional births and overall population growth of 11.3 percent. Use of the Series III rate was further assumed most reasonable because of the age distribution of the county's population. In 1975, persons aged 15-24 (those who would be in their prime child-bearing years over the course of the projection period) accounted for about 17 percent of Ashtabula County's population, compared to a nationwide share of 19 percent. Forecasts of population prepared by the Ashtabula County Planning Commission show the Principal Study Area's share of the county population (71 percent) remaining virtually unchanged through 1990. The implied trend in this ratio based on actual 1975 data and the Planning Commission estimate was interpolated to develop forecasts of the Principal Study Area's population in the intervening years. Based on this approach, the population of the Principal Study Area is forecast to reach 78,900 by 1990. The share of Ashtabula County population in the Local Study Area is projected to decline somewhat, thereby continuing the historical slide. In 1970, the city of Conneaut accounted for 14.8 percent of the county's residents and by 1990 this proportion is expected to decline to 14.4 percent. This decline translates into a slightly slower rate of population growth for the Local Study Area relative to the region over the forecast period. In 1975, the population of Conneaut totaled 14,700, by 1990, it is forecast at 15,800.

Characteristics of the Population

2.129

The forecasts of population characteristics includes age, sex, and education were all derived using the same methodology. Ratios were calculated for each study area's population characteristics relative to the United States in the last complete census (1970). The relationships were assumed to remain constant throughout the forecast period. For example, in 1970, Ashtabula County's proportion of population in the 6 to 11 year old group was five percent above the national average. This age group's relative share is forecast to decline from 12.0 percent of total national population in 1970 to 8.5 percent in 1990. Thus, the Regional Study Area is assumed to experience a similar proportional change--from 12.6 percent in 1970 to 9.0 percent in 1990. Forecasts of the age distribution of the population in the Ohio Local, Principal, and Regional Study Area are

shown in Table 2-77. Based on the methodology outlined above, all the study areas are expected to experience the following trends:

> Decline in the share of total population in the 0-5 years age group during all forecast periods except 1980 to 1985 when an increase in the birth rate causes a slight relative rise in this age group. This turnaround reflects the fact that children of the post-World War II baby boom will be in their prime child-bearing years during this period.
>
> Decline in the percent of population 6-14 years in all periods, although the decline will be minor between 1985 and 1990 as the increase in births during 1980 to 1985 enter this age group.
>
> Decline in the proportion of population 15-24 years of age because of low and declining birth rates in the early 1970's.
>
> Increase in the proportion of population over 25 years old because of the post-World War II baby boom and the relative slow down in the growth of population in other age groups.

The distribution of the population by sex is shown in Table 2-78. These forecasts indicate that females will continue to outnumber males and that their share of total population will, in fact, increase between 1975 and 1990. This reflects the longer life expectancy for females. Forecasts of the distribution of population by educational attainment are presented in Table 2-79. The basic trends for all three of the study areas point to a general increase in the educational levels of the population. Sharp declines are expected in the proportion of residents with less than a high school education. While the share of the population with a high school education is expected to remain constant, a continual rise is expected in the proportion receiving some post-secondary education (college, junior college, vocational training, etc.). The increase in the share of population attending institutions of higher learning will reinforce the trend of out-migration of population in the 18-24 year old age group, as many students leave Ashtabula County to further their education. To forecast total households, national projections of changes in average household size were gathered. Those changes in average household size were applied to the three study areas (refer to Table 2-80). These forecasts show a continuing trend towards smaller households, but the rate of decrease levels off in the forecast period. From 1970 to 1975, average household size declined 6.5 percent. The forecasts show a 5.4 percent decline from 1975 to 1980, 5.3 percent from 1980 to 1985, and 1.9 percent 1985 to 1990. These changes indicate that by 1990, the Regional Study Area will have an

Table 2-77

Forecasts of Age Distribution of Population in the Ohio Regional Study Area (Percent)

	Age Groups				
	0-5	6-14	15-24	25-65	65+
Local Study Area					
1975	9.8%	15.6%	16.0%	46.4%	12.2%
1980	8.7	13.6	16.0	48.8	12.9
1985	9.2	12.1	14.2	51.0	13.5
1990	9.0	11.8	12.2	52.8	14.2
Principal Study Area					
1975	9.9	16.8	17.1	45.5	10.7
1980	8.8	14.6	17.3	48.0	11.3
1985	9.5	12.9	15.3	50.4	11.9
1990	9.1	12.8	13.3	52.3	12.5
Regional Study Area					
1975	9.6	17.1	16.9	45.5	10.9
1980	8.6	15.0	17.0	47.9	11.5
1985	9.2	13.2	15.1	50.3	12.2
1990	8.9	13.1	13.1	52.1	12.8

Source: Current Population Reports, Series P-25, No. 601, October, 1975, U.S. Department of Commerce, Bureau of the Census; and Arthur D. Little, Inc. estimates.

Table 2-78

Forecasts of Population by Sex in the Ohio Regional Study Area

	Population		Percentage	
Local Study Area	**Male**	**Female**	**Male**	**Female**
1975	6,991	7,709	47.56%	52.44%
1980	7,140	7,910	47.44	52.56
1985	7,316	8,134	47.35	52.65
1990	7,470	8,330	47.28	52.72
Principal Study Area				
1975	36,238	38,712	48.35	51.65
1980	36,727	39,423	48.23	51.77
1985	37,405	40,295	48.14	51.86
1990	37,926	40,974	48.07	51.93
Regional Study Area				
1975	49,623	52,377	48.65	51.35
1980	50,666	53,734	48.53	51.47
1985	51,976	55,324	48.44	51.56
1990	53,110	56,690	48.37	51.63

Source: U.S. Department of Commerce, Bureau of the Census, and Arthur D. Little, Inc. estimates.

Table 2-79

Forecasts of Educational Attainment in the Ohio Regional Study Area

	Percent of Population 25 years or Older Completing		
	Elementary 0-8 Yrs	High School 1-4 Yrs	Post-Secondary Schooling
Local Study Area			
1975	19%	69%	12%
1980	15	71	14
1985	13	71	16
1990	10	71	19
Principal Study Area			
1975	20	66	14
1980	16	68	16
1985	13	68	19
1990	10	68	22
Regional Study Area			
1975	19	67	14
1980	15	68	17
1985	13	68	19
1990	11	68	21

Source: U.S. Department of Commerce, Bureau of the Census, and Arthur D. Little, Inc. estimates.

Table 2-80

Household Forecasts in the Ohio Regional Study Area

	Number of Households				People Per Household			
	1975	1980	1985	1990	1975	1980	1985	1990
Local Study Area								
Conneaut	5,176	5,595	6,059	6,320	2.84	2.69	2.55	2.50
Principal Study Area	24,816	26,625	28,672	29,662	3.02	2.86	2.71	2.66
Kingsville Township and Village	1,403	1,625	1,867	2,058	3.35	3.17	3.00	2.94
Ashtabula Township	2,568	2,821	3,094	3,269	2.96	2.80	2.65	2.60
Ashtabula City	8,127	8,286	8,433	8,232	2.99	2.83	2.68	2.63
Saybrook Township	2,198	2,561	2,979	3,309	3.05	2.89	2.74	2.69
Regional Study Area	33,225	35,879	38,868	40,517	3.07	2.91	2.76	2.71

Source: Arthur D. Little, Inc. estimates based on Current Population Reports, Series P-25, No. 607, U.S. Department of Commerce, Bureau of the Census, August 1975.

average of 2.71 people per household, the Principal, 2.66, and the Local, 2.50. Forecasts of the number of households in the three study areas were derived by dividing the population estimates by the forecasts of the average number of people per household. The forecasts show the number of households growing at about 1.3 percent annually from 1975 to 1990 for each of the Study Areas. Forecasts of the age distribution of household heads are included in Table 2-81. These were developed based on the same methodology used to estimate the age distribution of the population--projected changes in the age distribution of household heads at the national level were applied to the 1970 base data in each of the study areas. During the 1970 to 1975 period, the increase in number of households was largely concentrated within two broad age-of-head groups, those with heads under 35 years of age, and with heads 65 years and over. This increase was largely a function of the rapid rise in the number of elderly persons and the tendency for a greater number of such persons to maintain their own homes after their families have left. The increase in households with heads 25 to 34 years old in 1970 to 1975 period was also particularly large and reflects the sharp rise in the number of births between the late 1930's and late 1940's. With the continued movement into later adult years by persons born in the late 1940's and the entry into the adult groups of persons born in the similarly high fertility years of the 1950's and early 1960's, the major portion of the projected increase in the number of households from 1975 to 1990 will occur in those headed by persons between the ages of 25 and 44 years. In the Regional Study Area, households headed by people in the 25-44 age group accounted for 34.9 percent of the total in 1975, they are expected to increase to 41.2 percent by 1990. In the Principal Study Area, households with heads between the ages of 25 and 44 accounts for 32.7 percent of the total in 1975. By 1990, their contribution is estimated to increase to 38.7 percent. In the Local Study Area, with a higher proportion of older household heads than the other areas, only 30.9 percent were 25 to 44 years old in 1975. However, by 1990, this group is forecast to increase to 36.8 percent of all households.

Pennsylvania Regional Study Area

Methodology and Assumptions

2.130
In developing population forecasts for the Pennsylvania Regional Study Area and its components, a number of basic sources were examined in arriving at a projection methodology. These sources were also gleaned for deriving projections of the likely characteristics of the future population in the study area including age, sex, migration, educational attainment, and number and average size of households. Basic source materials for projections of the Regional Study

Table 2-81

Forecasts of Households by Age of Head of Household in the Ohio Regional Study Area

	Percentage of Households by Age of Head				
	14-24 Years	25-34 Years	35-44 Years	45-64 Years	65+ Years
Local Study Area					
1975	6.8%	16.1%	14.8%	37.7%	24.6%
1980	6.8	17.6	15.4	35.1	25.1
1985	6.2	18.2	17.6	32.7	25.3
1990	5.3	17.6	19.2	32.0	25.9
Principal[1] Study Area					
1975	7.8	18.0	14.7	36.0	23.5
1980	8.0	19.5	15.3	33.4	23.8
1985	7.2	20.2	17.4	31.2	24.0
1990	6.1	19.6	19.1	30.6	24.6
Regional Study Area					
1975	7.4	18.8	16.1	36.6	21.1
1980	7.5	20.5	16.6	34.0	21.4
1985	6.8	21.1	18.9	31.7	21.5
1990	5.7	20.5	20.7	31.0	22.1

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(1) Estimated from historical data using cities of Conneaut and Ashtabula.

Source: U.S. Department of Commerce, Bureau of the Census, and Arthur D. Little, Inc. estimates.

Area and its components included preliminary forecasts developed by the Pennsylvania Office of State Planning and Development (OSPD); an analysis of the population in Erie County performed by the Erie Metropolitan Planning Department; and a comparison of study area population and population characteristics with forecasts made by the U.S. Bureau of the Census.* The population forecasts contained in these sources were adjusted to reflect anticipated changes in job opportunities, nature of the labor force in terms of male and female participation rates, and finally the level of unemployment that could be sustained in the area. Basically, the population projections for the 1975-1980 period shown in Table 2-82 are those developed by the Pennsylvania Office of State Planning and Development (OSPD). For the years 1980-1990, a slight downward adjustment was made to estimates developed by OSPD to better reflect the balance between anticipated employment opportunities, size of the labor force, and resultant total population growth. The projections indicate that the Principal Study Area will maintain its share of the population in the Regional Study Area. In 1975, the Principal Study Area represented 71.9 percent of the region. By 1990, it will have declined to 71.6 percent. Within the Principal Study Area, the projections assume that faster growth in population will occur outside the city of Erie. For example, Millcreek Township will increase its share of total population in the Principal Study Area from 15.2 percent to 16 percent, while Fairview and Girard will also increase their relative shares (refer to Table 2-82). The Local Study Area of Springfield Township and East Springfield Borough is expected to show a significant population increase. However, because of its small base, its share of total population in the Principal Study Area will increase only modestly. The population forecasts for the Regional Study Area were disaggregated into their components of change based upon trends at the national level. For example, projected annual rates of natural increase for the Regional Study Area were adjusted to reflect historical differences between it and the nation as a whole. Also, the historical relationships between the national and Regional Study Area birth and death rates was held constant and the proportion applied to forecasts of these rates for the U.S. through 1990.* The results of this procedure (shown in Table 2-83) indicate that in the five-year period, 1975-1980, the Regional Study Area would change from one of a modest net out-migration to one of a modest net in-migration. For the period 1980-1985, out-migrants are assumed to reach 1,600 while in the final five-year period, 1985-1990, a shift back to a net in-migration position is expected. For the total period 1975-1990, there is an out-migration of only 200 people.

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*Projections of the Population of the United States 1975-2050. U.S. Department of Commerce, Bureau of the Census.

Table 2-82

Population Projections for the Pennsylvania Regional Study Area

	1975	1980	1985	1990	Percent Change 1975-90	Annual Average Rate of Growth 1975-90
Regional Study Area	356,600	370,800	383,400	396,400	11.2%	0.7%
Principal Study Area	256,350	264,900	274,300	284,000	10.8	0.7
Coastal Communities	56,300	60,100	63,575	68,050	20.8	1.3
Milcreek Township	39,000	41,300	42,950	45,600	16.9	1.0
Girard Area(1)	8,800	9,400	10,275	11,150	26.7	1.6
Fairview Township & Borough	8,500	9,400	10,350	11,300	32.9	1.9
Local Study Area	3,200	3,400	3,725	4,000	25.0	1.5

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(1) Includes Girard Township and Borough, Lake City and Platea Borough.

Source: Erie County Population Analysis, Erie Metropolitan Planning Department, August, 1972; Pennsylvania Office of State Planning and Development; and Arthur D. Little, Inc. estimates.

Table 2-83

Forecasts of Components of Population Change for the Pennsylvania Regional Study Area

Period	Net Change	Natural Increase	Births	Deaths	Net Migration
1970-75 (Actual)	11,600	12,000	30,600	18,600	- 400
1975-80	14,200	13,900	33,500	19,600	+ 300
1980-85	12,600	14,200	34,900	20,700	-1,600
1985-90	13,000	11,900	34,200	22,300	+1,100

Source: Population Estimates, Current Population Reports, Series P-26 No. 75-38, U.S. Bureau of the Census, August 1976; Arthur D. Little, Inc. estimates.

Estimates of migration patterns reflect the balance between the increase in total population and the net change due to natural growth (i.e., births less deaths). As noted above in the discussion of population projections for the Ohio Regional Study Area, assumptions concerning net migration and fertility rates were chosen to present a conservative baseline population projection and thus yield worst case levels of impact. OSPD population projections for the Pennsylvania Regional Study Area were also modified to present more conservative estimates. Based on OSPD estimates, the Pennsylvania Regional Study Area is expected to experience a very small out-migration of 200 persons over the 1975-1990 period. However, if out-migration were to continue at the 1970-1975 rate of only 80 persons per year, total out-migration for the projection period would be 1,200 persons. Use of this latter assumption would have an insignificant effect on projected population growth rates in the Regional Study Area of 11 percent between 1975 and 1990 or 0.7 percent per year. Different assumptions about fertility rates would have a much greater effect on baseline population projections. As noted above, OSPD population projections were disaggregated into their components of change based on Bureau of the Census Series III national projections. Use of the higher Series I fertility rate (2.7 children per woman) would imply approximately 39,200 additional births in the Pennsylvania Regional Study Area between 1975 and 1990, increasing the overall level of growth from 11.2 percent to 22.2 percent and the annual rate of growth from 0.7 percent to 1.3 percent. The Series II fertility rate (2.1 children per woman) would imply about 15,400 additional births, overall population growth of 15.5 percent, and an average annual growth rate of 1.0 percent. These higher fertility rates would generate population estimates for 1990 that are 10 percent and four percent, respectively, above the 396,400 baseline population estimate used in this analysis.

Characteristics of the Population

2.131
The forecast of population characteristics such as age, sex, and education were derived using the methodology noted above. Population characteristics in the Regional Study Area and its components were compared to those at the national level in the last complete census year (1970). The relationships were assumed to remain constant throughout the forecast period so that changes in the Regional Study Area would parallel those estimated to occur at the overall national level. Forecasts of the population age distribution for the Local, Principal, and Regional Study Areas for 1980, 1985, and 1990 are presented in Table 2-84. Communities in the Regional Study Area may experience the following trends. Decline in the share of total population in the 0-5 age group during all the forecast periods except 1980-1985 when there is a relative increase in births as a result of

Table 2-84

Forecasts(1) of Age Distribution of Population in the Pennsylvania Regional Study Area

	Percentage by Age Groups					
Local Study Area	0-5	6-14	15-24	25-65	65+	Total
1975	8.8%	25.5%	12.6%	43.2%	9.9%	100.0%
1980	8.2	23.0	12.7	46.7	9.4	100.0
1985	8.9	20.5	11.7	49.6	9.3	100.0
1990	8.5	21.2	10.1	51.6	8.6	100.0
Principal Study Area						
1975	8.0	18.3	18.2	44.8	10.7	100.0
1980	7.4	16.3	18.2	48.1	10.0	100.0
1985	8.0	14.6	16.7	50.8	9.9	100.0
1990	7.8	15.2	14.6	53.4	9.0	100.0
Regional Study Area						
1975	8.1	18.2	18.3	44.6	10.8	100.0
1980	7.5	16.2	18.3	47.8	10.2	100.0
1985	8.1	14.5	16.8	50.6	10.0	100.0
1990	7.9	15.1	14.6	53.2	9.2	100.0

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(1) Based on lower fertility rate than in the past 30 years.

Source: Current Population Reports, Series P-25, No. 610, October 1975, U.S. Department of Commerce, and Arthur D. Little, Inc. estimates.

a relative increase in child bearers. Decline in the share of the 6-14 year age group except for 1985-1990. This reflects the movement of the 0-5 age group that increased its share in the 1980-1985 period through the population group. Decline in the proportion of population in the 15-24 age because of low and declining birth rates in the early 1970's. Increase in the proportion of population over 25 years due to the post-World War II baby boom and the relative slowdown in the growth of population in other age groups. Distribution of the population by sex for the projected period is shown in Table 2-85. These forecasts indicate that females will continue to outnumber males in the total population for all parts of the Regional Study Area except in the Local Study Area. Forecasts of the distribution of the population by educational attainment for the Regional Study Area are presented in Table 2-86. The data reflect two basic trends: 1) a decrease in the proportion of individuals with less than eight years of schooling, and 2) an increase in the number of people undertaking post-secondary education. High school graduates, as a share of the total, are expected to remain relatively constant. The increase in the relative number of students enrolled in higher education programs will reinforce the trend toward an older population in the Regional Study Area. Information dealing with the Local and Principal Study Areas could not be obtained from the U.S. Bureau of the Census due to the small size of the reporting units in these areas. However, forecasts for the Local and Principal Study Areas are expected to differ little from those for the Regional Study Area. Based on expected population levels, the number of households in the Local Study Area is projected to increase from 991 in 1975 to 1,404 by 1990. This represents a net increase of 41.7 percent, or an average annual rate of 2.3 percent. The rate of growth in the number of households for the Local Study Area will exceed that for the Regional Study Area, raising the proportion for the Local Study Area, from 0.9 percent to about 1.0 percent of all households in the Regional Study Area. The trend towards smaller households will be characteristic of all communities in the Pennsylvania Regional Study Area. While average household size in the Local Study Area is expected to continue to exceed the Regional Study Area, it is expected to drop below 3.0 by 1985, and to reach 2.85 people per household by 1990 (refer to Table 2-87).

Housing

a) Building Types and Occupancy Characteristics

Ohio Regional Study Area

Housing Types

2.132
In 1970, the Ohio Local Study Area contained 5,179 year-round housing units. Year-round units are all occupied units plus vacant units

Table 2-85

Baseline Population Projections by Sex in the Pennsylvania Regional Study Area

			Percent Distribution	
Local Study Area	Male	Female	Male	Female
1975	1,640	1,560	51.3%	48.7%
1980	1,740	1,660	51.2	48.8
1985	1,900	1,825	51.0	49.0
1990	2,040	1,960	51.0	49.0
Principal Study Area				
1975	123,800	132,500	48.3	51.7
1980	127,700	137,200	48.2	51.8
1985	131,900	142,400	48.1	51.9
1990	136,300	147,700	48.0	52.0
Regional Study Area				
1975	172,100	184,300	48.3	51.7
1980	178,700	192,100	48.2	51.8
1985	184,400	199,000	48.1	51.9
1990	190,300	206,100	48.0	52.0

Source: Arthur D. Little, Inc. estimates.

Table 2-86

Forecasts of Educational Attainment in the Pennsylvania Regional Study Area

	Percent of Population 25 Years or Older Completing		
Year	Elementary 0-8 Years	High School 1-4 Years	Post-Secondary Schooling
1975	20%	63%	17%
1980	17	64	19
1985	15	64	21
1990	13	64	23

Source: Arthur D. Little, Inc. estimates

Table 2-97 Household Forecasts in the Pennsylvania Regional Study Area

	Number of Households				People Per Household			
	1975	1980	1985	1990	1975	1980	1985	1990
Local Study Area								
Springfield Township & East Springfield Borough	991	1,111	1,284	1,404	3.23	3.06	2.90	2.85
Principal Study Area	82,695	90,410	99,025	104,410	3.10	2.93	2.77	2.72
Girard Area	2,839	3,208	3,709	4,099	3.10	2.93	2.77	2.72
Fairview Township & Borough	2,374	2,773	3,224	3,587	3.58	3.39	3.21	3.15
Millcreek Township	12,381	13,859	15,230	16,464	3.15	2.98	2.82	2.77
Regional Study Area	116,156	127,423	138,913	146,273	3.07	2.91	2.76	2.71

Source: Arthur D. Little, Inc. estimates based on data from U.S. Department of Commerce, Bureau of the Census.

which are intended for year-round use. Of these, 82 percent were single-family structures, 16 percent multi-family, and two percent mobile homes. The vast majority (71 percent) of these units were owner occupied, while 22 percent were renter occupied, and seven percent were vacant. Housing Inventories and Occupancy Characteristics within the Ohio Regional Study Area are presented in Tables 2-88 and 2-89, respectively. In all of the Coastal Communities of the Ohio Regional Study Area, single-family units account for the vast majority of the housing inventory. Only in Ashtabula City do they account for less than 80 percent of total. In Saybrook Township, their share is the highest at 91 percent. In the Ohio Regional Study Area, most of the multi-family housing is in two-four unit, low-density, structures. Only in the city of Ashtabula do units in structures of five or more units exceed four percent of the total housing inventory. Localities in the Ohio Regional Study Area are generally rural in character and have a higher proportion of mobile homes in their inventories than the State. In 1970, mobile homes accounted for two percent of Ohio's housing inventory. Only Ashtabula City was below this level at 1.4 percent, while in Ashtabula Township, mobile homes accounted for more than 14 percent of total housing units.

Occupancy Characteristics

2.133
A dominant characteristic of the Ohio Regional Study Area is the predominance of owner-occupied units. Only in the city of Ashtabula do owner-occupied units account for less than 70 percent of total year-round units. However, this proportion is still above the State average of 65 percent. The cities generally have a greater share of renter-occupied housing units in multi-family structures than the more rural townships, as multi-family units are typically renter-occupied. This is confirmed by the data presented in Table 2-89 which shows the cities of Ashtabula and Conneaut with the highest incidence of renter-occupied housing. Table 2-89 also includes the number of year-round vacant units in the inventory of the Ohio Study Area. These vacant units are subdivided by the Census as follows: For sale, For rent, Rented or sold awaiting occupancy, Held for occasional use, and Other Vacant - including units held for settlement of an estate, units held for occupancy by a caretaker, and units held for personal reasons of the owner. The vacancy rates in the Ohio Regional Study Area show considerable variance. In Kingsville Township (vacancy rate of 4.1 percent), Ashtabula Township (1.9 percent), and Ashtabula City (4.0 percent), they are below the national average of 6.2 percent and the State average of 4.6 percent. However, in the city of Conneaut (7.6 percent), the township of Saybrook (14.5 percent), and the overall Regional Study Area (6.9 percent) the rates are higher than the national average. The vacant

Table 2-33 Housing Inventory in the Ohio Regional Study Area--1970
(Year-Round Units)

	Total	Single-Family	2-4 Units	Multi-Family	Mobile Homes
Local Study Area					
Conneaut City	5,179	4,225	641	168	115
Principal Study Area					
Kingsville Township and Village	1,218	1,057	74	21	66
Ashtabula Township	2,402	1,933	103	23	343
Ashtabula City	7,918	5,831	1,610	364	113
Saybrook Township	2,393	2,183	73	55	82
Regional Study Area	32,166	26,472	3,392	887	1,415
	Percent of Total Units				
Local Study Area					
Conneaut City	100.0%	82.2%	12.4%	3.2%	2.2%
Principal Study Area					
Kingsville Township and Village	100.0	86.8	6.1	1.7	5.4
Ashtabula Township	100.0	80.5	4.3	0.9	14.3
Ashtabula City	100.0	73.7	20.3	4.6	1.4
Saybrook Township	100.0	91.2	3.1	2.3	3.4
Regional Study Area	100.0	82.3	10.5	2.8	4.4

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

Table 2-89

Occupancy Characteristics of Housing Inventory in the Ohio Regional Study Area—1970

	Total Year-Round Units	Total Occupied Units	Owner-Occupied	Renter-Occupied	Vacant	Percent of Year-Round Units		
						Owner-Occupied	Renter-Occupied	Vacant
Local Study Area								
Conneaut City	5,179	4,785	3,662	1,123	394	70.7%	21.7%	7.6%
Principal Study Area								
Kingsville Township and Village	1,218	1,168	950	218	50	78.0	17.9	4.1
Ashtabula Township	2,402	2,356	2,020	336	46	84.1	14.0	1.9
Ashtabula City	7,918	7,604	5,384	2,220	314	68.0	28.0	4.0
Saybrook Township	2,393	2,046	1,689	357	347	70.6	14.9	14.5
Regional Study Area	32,166	29,953	23,250	6,703	2,213	72.3	20.8	6.9

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

units are subdivided into "for sale," "for rent," and "other" in Table 2-90. These data indicate a low proportion of "for sale" units in all the areas. Rental vacancies are much more numerous. For example, in Ashtabula Township, rental vacancies comprised 59 percent of total vacant units in 1970, while "for sale" units were just 26 percent of the total. In the Local Study Area, the city of Conneaut, vacant rental units accounted for 33 percent of vacancies, "for sale" units-14 percent, and "other" units-53 percent. These other vacancies were predominantly units held for occasional use (e.g., vacation homes), but they are intended for year-round use.

Low Income and Moderate Income Housing

2.134
Low and moderate income housing basically is built in four ways: under public housing, rent supplement, interest subsidy, or Federal Housing Administration (FHA) mortgage insurance. While often funded by the Federal Government, public housing is administered by local housing authorities, which build the apartments, and operate and maintain the property. The rents are low since the local housing authority is not paying off the initial capital charges. It is up to each individual housing authority to determine income levels of people eligible for the housing. The rent supplement program (currently Section 8 Lower Income Rental Assistance) allows low-income families to occupy houses or apartment units owned by developers but financed or insured by FHA programs. The owner of a building receives authorization from FHA to rent a certain number of units to low-income families with the Government paying rent supplements to the renter. The law requires that the tenant pay 25 percent of his income as rent and as his income rises, his rent rises proportionately. The third type of low-income housing is based on interest subsidies of which there are four separate programs Under Section 221(d)(3) of FHA, a nonprofit or limited-dividend developer submits plans and a feasibility study for a project to the FHA and, upon approval, is insured 100 percent of the mortgage at the FHA ceiling interest rate. The insured mortgage amounts are controlled by statutory dollar limits per unit which are intended to assure moderate construction costs. The below-market mortgage reduces the rents necessary for the project. The income levels for eligible renters vary according to local conditions, but the rents in general are higher than for public housing. Section 221(d)(4) is an interest subsidy program similar to Section 221(d)(3) only if it is applicable to moderate income households. Statutory unit limit mortgage amounts are greater for Section 221(d)(4), but only 90 percent of the mortgage will be insured at the FHA ceiling interest rate. Units furnished under both programs may qualify for assistance under Section 8 if occupied by eligible low-income families. Section 235 provides mortgage insurance and interest subsidy for low- and

Table 2-90

Vacancy Characteristics of Housing Inventory in the Ohio Regional Study Area--1970

	Year-Round Vacant Units				Percent of Vacant Units		
	Total	For Sale	For Rent	Other	For Sale	For Rent	Other
Local Study Area							
Conneaut City	394	54	129	211	13.7%	32.7%	53.6%
Principal Study Area							
Kingsville Township and Village	50	7	19	24	14.0	38.0	48.0
Ashtabula Township	46	12	27	7	26.1	58.7	15.2
Ashtabula City	314	72	138	104	22.9	44.0	33.1
Saybrook Township	347	24	19	304	6.9	5.5	87.6
Regional Study Area	2,213	264	526	1,423	11.9	23.8	64.3

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

moderate-income home buyers. To enable eligible families to afford new homes, HUD insures mortgages and makes monthly payments to lenders to reduce interest to as low as four percent. The homeowner must contribute 20 percent of adjusted income to monthly mortgage payments and must make a downpayment of three percent of the cost of acquisition. Prior to 1976, this program provided larger subsidies to lower-income households and required a substantially smaller investment from them. Those commitments made before 1976 are still in effect. Section 236 is a program which insured multi-family mortgages and paid interest subsidies to lenders which allowed the mortgage to be paid off at an interest rate as low as one percent. Occupants paid the developer 25 percent of their income. This program is suspended except for the commitments issued before the moratorium. The final type of low or moderate income housing support program is the FHA mortgage insurance program. It guarantees the mortgage of a moderate income family to the commercial banks and charges the mortgagor (i.e., the bank) an insurance fee which writes off the cost of the program to the Government. This program helps buyers to assume mortgages which they could not negotiate with commercial financial institutions and usually permits lower downpayments than for conventional mortgages. Most of the low-income housing in the Ohio Regional Study Area is in the city of Ashtabula. Public housing in Ashtabula City is located at four sites and includes 351 units; of these, 236 are for the elderly and 115 for low-income families. These units are part of the inventory shown in Table 2-88. The units are located in apartment buildings which were constructed with Federal financing arranged through the U.S. Department of Housing and Urban Development (HUD). They operate on income generated from rentals and Federal subsidies and are controlled by the Ashtabula Metropolitan Housing Authority. In the city of Conneaut, there has been one project of 10 low-income homes built within the last 10 years. These homes were built under the HUD Section 235 housing subsidy program for owner occupancy. Currently there are no low-income rental units in the city of Conneaut built under public housing programs. However, in 1976, the city employed a Housing Planner and began a Public Housing Program. A Housing Assistance Plan is currently in effect which has established a goal of 100 units of housing for the elderly, 100 units of housing rehabilitation, and 60 units of Section 235 (sales) housing for lower income families in the next year. The overall three-year goal is 400 units for the elderly, 150 for low-income, 300 units of housing rehabilitation, and 60 units of Section 235 new construction. There is no Public Housing Authority with jurisdiction over the entire Ohio Regional Study Area. The Ashtabula Metropolitan Housing Authority covers only the city of Ashtabula, Ashtabula Township, and Saybrook Township. The current year goal for the county is 100 units of low income, five units of rehabilitation, and 15 units of Section 235 homes. Currently, there are 69 housing units

under construction in Jefferson under the FHA mortgage insurance program.

Pennsylvania Regional Study Area

Housing Types

2.135
In 1970, the Local Study Area of Springfield had a housing inventory of 911 year-round units. The rural nature of this area is reflected by the prevalence of single-family structures (82 percent of all housing units) and mobile homes (12 percent) in the area's housing stock. Only six percent of the total stock is in multi-family structures. Mobile homes have a higher share of the housing inventory in Springfield than in any of the other Pennsylvania Coastal Communities. A housing inventory for the Pennsylvania Regional Study Area is presented in Table 2-91. The townships and boroughs of the Pennsylvania Coastal Communities (Girard, Fairview, and Millcreek) also show a rural housing mix with a high single-family orientation --Fairview (93 percent), Millcreek (84 percent), and Girard (78 percent) - and a relatively small volume of multi-family units. Mobile homes as a percent of total year-round housing units are higher in these areas than the State average of two percent, but lower than in the Local Study Area. The overall housing mix for the principal and regional study areas is dominated by the city of Erie. Erie City accounted for 55 percent of the housing units in the Principal Study Area and 40 percent in the Regional Study Area. However, the city of Erie had 85 percent of the Principal Study Area's multi-family units and 65 percent of those in the Regional Study Area. This more urban orientation distinguished the housing mix in the Principal and Regional Study Areas from that in the Local Study Area and Coastal Communities. Single-family housing units accounted for just 71 percent of the housing inventory in the Principal Study Area in 1970, while multi-family units comprised 26 percent, and mobile homes three percent. This housing mix is very similar to that of the Regional Study Area and the Commonwealth of Pennsylvania. In the Regional Study Area, 72 percent of the stock was in single-family structures, 25 percent in multi-family, and three percent in mobile homes. For the State, the shares are 73 percent single-family, 25 percent multifamily, and two percent mobile homes.

Occupancy Characteristics

2.136
Occupancy characteristics in the Pennsylvania Regional Study Area are dictated primarily by the housing type mix with owner occupancy very dominant. In the Local Study Area, 96 percent of the year-round 1970

Table 2-91

Housing Inventory in the Pennsylvania Regional Study Area -- 1970
(Year-Round Units)

	Total	Single-Family	Multi-Family	Mobile Home
Local Study Area				
Springfield Township & East Springfield Borough	911	746	59	106
Principal Study Area	78,406	55,746	20,386	2,274
Girard Area	2,548	1,990	301	257
Girard Township & Borough	1,797	1,414	210	173
Lake City Borough	646	484	85	77
Platea Borough	105	92	6	7
Fairview Township & Borough	2,213	2,058	90	65
Millcreek Township	11,330	9,559	1,169	602
Regional Study Area	110,528	79,641	27,287	3,600
Erie County	82,954	58,554	22,126	2,274
Crawford County	27,574	21,087	5,161	1,326
	Percent of Total Units			
Local Study Area				
Springfield Township & East Springfield Borough	100.0%	81.9%	6.5%	11.6%
Principal Study Area	100.0	71.1	26.0	2.9
Girard Area	100.0	78.1	11.8	10.1
Fairview Township & Borough	100.0	93.0	4.1	2.9
Millcreek Township	100.0	84.4	10.3	5.3
Regional Study Area	100.0	72.1	24.7	3.2

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

inventory was occupied, with 81 percent owner-occupied. In volume, owner-occupied units outnumbered renter-occupied units by better than 5 to 1 (refer to Table 2-92), as less than 15 percent of the inventory was occupied by renter households. The same occupancy patterns exist in the Pennsylvania Coastal Communities, where at least 80 percent of housing units were owner-occupied and less than 17 percent were renter-occupied. The highest areas of owner occupancy are Platea and Fairview with 89 percent and 83 percent homeowner rates, respectively. In the Principal and Regional Study Areas which include the city of Erie, renter rates are higher than in the rural areas. In the Principal Study Area, renter rates averaged 27 percent while homeowner rates were only 68 percent. The occupancy characteristics in the Regional Study Area were virtually the same as those for the Principal Study Area. The vacancy rates among the Pennsylvania Study Areas are much more consistent than in Ohio. In most of the areas, vacant units account for about four percent of housing inventories, the same as the State's four percent average, but below the national average of six percent. Only in Fairview does the vacancy rate reach this higher average. In the Local Study Area, the number of vacancies in 1970 totaled 36 units, or 4.0 percent of total units. Of these units, only four were vacant and "for sale," six were "for rent," and 26 were "other" vacant units (e.g., seasonal or vacation units intended for year-round use) as shown in Table 2-93. In all the Pennsylvania Coastal Communities (except Fairview and Platea), "for sale" units represent the smallest proportion of all vacant units, rental vacancies are higher. Since renter households are generally younger and more mobile than owner household, there tends to be a higher proportion of vacant rental units in housing inventories.

Low-Income Housing

2.137
All the public housing in the Pennsylvania Regional Study Area is located in the city of Erie. As of 1972, the city of Erie Housing Authority operated 1,881 public housing units including 540 units for the elderly. Total population in public housing in that year numbered 6,896. The Bureau of Census reports no additional public housing permits in either Crawford or Erie Counties since 1972. By late 1972, there were 738 units of subsidized housing either occupied (288 units) or under construction (450 units) in the Pennsylvania Regional Study Area. Most of these units are located in Erie City (401 units), with the remainder located in Millcreek Township (204 units) and Harborcreek Township (133 units). All of these units were made available under three Federal Housing Programs, Section 236 rental, Section 235 owner, or Section 221(d)(3) rental. In addition, 1,122 units have been proposed for construction -- 232 in Millcreek Township and 890 in Erie City. The status and location of subsidized

housing in the Pennsylvania Principal Study Area is summarized in Table 2-94.

b) *Value and Condition of Housing Inventory*

Ohio Regional Study Area

Value

2.138
Statistics reported by the U.S. Bureau of the Census on the value of owner-occupied housing represent the owner's estimate of how much his property (house and lot) would sell for if it were for sale. The value data are reported for those single-family houses on less than 10 acres without a commercial establishment or medical office on the property. For rental units, contract rent is utilized and represents the monthly rent agreed to, or contracted for, regardless of any furnishings, utilities, or services that may be included. Gross rent is the contract rent plus the estimated average monthly cost of utilities and fuel, if these items are paid for by the renter in addition to the rent. Thus, gross rent is intended to eliminate differentials which result from varying rental practices. In the Local Study Area, the majority (60 percent) of owner-occupied single-family homes are valued in the $5,000 to $15,000 range. The mean value in 1970 was $14,300, the lowest in the Ohio Coastal Communities. Less than 10 percent of Conneaut's single-family homes were valued at over $25,000. Conneaut also has lower priced rental units, as more than 60 percent of these units had gross monthly rents of under $100, the mean gross rent was $95 in 1970. The value of housing in the Ohio Regional Study Area is summarized in Table 2-95. Based upon Bureau of the Census data, the area with the most expensive housing is Saybrook Township. The mean value of single-family homes in Saybrook Township was reported as $22,110 in 1970, 55 percent higher than in the city of Conneaut. In Saybrook, 30 percent of all single-family owner-occupied homes were valued at over $25,000. The mean gross monthly rent in Saybrook was $126, 33 percent higher than in Conneaut, with close to 65 percent of rental units having monthly rents over $100. Housing values in the remaining Ohio Coastal Communities are mixed. In Kingsville, rental units are relatively inexpensive, while the value of owner-occupied single-family units was 17 percent above Conneaut's average. In Ashtabula Township, housing values are almost as high as in Saybrook. In the Ohio Regional Study Area, the mean value of single-family homes was $16,360 in 1970. This is below each of the Ohio Coastal Communities, except Conneaut. The average gross rent was $107, which was higher than the average for Conneaut and Kingsville, but below the other localities. Although published data on average housing values in the Ohio Regional Study Area since 1970 were not available, changes which have taken place in the North

Table 2-92

Occupancy Characteristics of Housing Inventory in the Pennsylvania Regional Study Area—1970

	Total Year-Round Units	Total Occupied Units	Owner-Occupied	Renter-Occupied	Vacant	Percent of Year-Round Units: Owner-Occupied	Percent of Year-Round Units: Renter-Occupied	Percent of Year-Round Units: Vacant
Local Study Area								
Springfield Township & East Springfield Borough	911	875	740	135	36	81.2%	14.8%	4.0%
Principal Study Area	78,406	74,537	53,557	20,980	3,869	68.3	26.8	4.9
Girard Area	2,548	2,452	2,026	426	96	79.5	16.7	3.8
Girard Township & Borough	1,797	1,718	1,430	288	79	79.6	16.0	4.4
Lake City Borough	646	631	503	128	15	77.9	19.8	2.3
Platea Borough	105	103	93	10	2	88.6	9.5	1.9
Fairview Township & Borough	2,213	2,071	1,838	233	142	83.1	10.5	6.4
Millcreek Township	11,330	10,907	9,306	1,601	423	82.2	14.1	3.7
Regional Study Area	110,528	104,433	75,236	29,197	6,095	68.1	26.4	5.5
Erie County	82,954	79,249	56,717	22,532	3,705	68.4	27.1	4.5
Crawford County	27,574	25,184	18,519	6,665	2,390	67.1	24.2	8.7

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

Table 2-93

Vacancy Characteristics of Housing Inventory in the Pennsylvania Regional Study Area—1970

	Year-Round Vacant Units				Percent of Vacant Units		
	Total	For Sale	For Rent	Other	For Sale	For Rent	Other
Local Study Area							
Springfield Township & East Springfield Borough	36	4	6	26	11.1%	16.7%	72.2%
Principal Study Area	3,869	399	1,288	2,182	10.3	33.3	56.4
Girard Area	96	24	25	47	25.0	26.0	49.0
Girard Township & Borough	79	21	20	38	26.6	25.3	48.1
Lake City Borough	15	3	5	7	20.0	33.3	46.7
Platea Borough	2	-	-	2	-	-	100.0
Fairview Township & Borough	142	19	11	112	13.4	7.7	78.9
Millcreek Township	423	68	211	144	16.1	49.9	34.0
Regional Study Area	6,095	653	1,881	3,561	10.7	30.9	58.4
Erie County	3,705	435	1,366	1,904	11.7	36.9	51.4
Crawford County	2,390	218	515	1,657	9.1	21.6	69.3

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

Table 2-94

Status of Subsidized Housing in the Pennsylvania Regional Study Area

	Number of Units			
Subsidized Units	Occupied	Under Construction	Proposed	Total
Section 235 Sales	120	65	--	185
Section 236 Rental	133	345	1,082	1,560
Section 211(d)(3) Rental	35	40	40	115
Total	288	450	1,122	1,860
Erie City	155	246	890	1,291
Harborcreek Township	133	--	--	133
Millcreek Township	--	204	232	436

Source: Housing Resources, Erie Metropolitan Planning Department.

Table 2-95

Value of Housing Inventory in the Ohio Regional Study Area -- 1970

	Percent of Total Units					
	Conneaut City	Kingsville Township & Village	Ashtabula Township	Ashtabula City	Saybrook Township	Regional Study Area
Owner-Occupied Single-Family Units						
Less than $ 5,000	5.0%	3.3%	0.6%	2.2%	1.5%	3.4%
5-10,000	32.8	19.8	13.5	26.2	10.0	21.3
10-15,000	27.8	27.3	27.7	34.8	24.6	30.2
15-20,000	16.1	22.9	26.5	19.1	17.5	19.9
20-25,000	8.9	12.6	15.1	8.8	15.7	12.1
25-35,000	7.0	11.4	12.9	6.4	18.7	9.7
35,000 or more	2.4	2.7	3.7	2.5	12.0	3.4
Mean Value	$14,300	$16,680	$18,260	$14,920	$22,110	$16,360
Renter-Occupied Units						
Under $40[1]	3.4%	-	1.6%	0.7%	-	1.6%
40-60	8.0	10.7	1.6	7.5	6.8	7.0
60-80	18.9	38.6	12.3	19.2	11.0	18.7
80-100	32.1	14.3	13.9	24.8	18.9	24.8
100-150	35.7	46.4	56.7	35.4	49.1	38.6
150-200	1.9	-	13.9	10.7	5.0	7.8
Over 200	-	-	-	1.7	9.2	1.5
Mean Value	$95	$96	$119	$107	$126	$107

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[1] Monthly gross rent

Source: 1970 Census of Housing, U. S. Department of Commerce, Bureau of the Census.

Central Region (based on Bureau of the Census definition) are noteworthy. In the entire North Central Region, the average value of owner-occupied single-family units increased 65 percent from 1970 to 1975, while average gross rents increased 35 percent. Although housing values in the North Central Region have been higher than those in the Ohio Regional Study Area, it seems reasonable to assume that the percentage increases experienced in the larger region would be representative of trends in the Ohio Regional Study Area. Under such an assumption, the mean value of owner-occupied single-family dwellings is estimated at $27,000 in 1975, while gross rents average $145 per month.

Plumbing Facilities

2.139
According to the Department of Housing and Urban Development and the Census Bureau, "substandard" housing includes dwelling units which are in poor structural condition and those which lack separate sanitary facilities. Therefore, data on plumbing facilities have been included as one indication of housing quality. Plumbing facilities are defined to include hot and cold piped water as well as a flush toilet and a bathtub or shower inside the structure for the exclusive use of the occupants of the unit. The 1970 housing units in the Ohio Regional Study Area are well equipped with plumbing facilities. In the cities of Conneaut and Ashtabula, 97 percent of year-round units had all plumbing facilities. In Conneaut, only 1.8 percent of all housing units lacked hot water, 1.2 percent were without a toilet, and 1.7 percent did not have a bathtub or shower. In the city of Ashtabula, the plumbing conditions in the housing inventory were even better. Fewer than one percent lacked hot water or a flush toilet and only 1.2 percent were without a bathtub or shower. On the average, housing units in the Ohio Regional Study Area were not quite as well equipped with plumbing equipment, as some parts of Ashtabula County are very rural. However, 94.3 percent of year-round units had all plumbing facilities, just slightly below the State average of 94.8 percent.

Age and Condition of the Housing Inventory

2.140
In most of the Ohio Regional Study Area, the housing inventory is quite old. In Conneaut, for example, 69 percent of units existing in 1970 were built prior to 1940, while only five percent had been built during the 1965-1970 period. The housing stock in Conneaut is older than the average for the State of Ohio, where only 47 percent of existing units were built prior to 1940 and 11 percent during the 1965-1970 period. An inventory of housing by age is presented in Table 2-96. Among the Ohio Coastal Communities, only the city of

Table 2-96

Age of Housing Inventory in the Ohio Regional Study Area -- 1970
(Percent of All Year-Round Units)

	Total	Built 1965 to 1970	1960 to 1965	1940 to 1960	Prior to 1940
Local Study Area					
Conneaut City	100.0%	5.3%	2.5%	23.0%	69.2%
Principal Study Area					
Kingsville Township & Village	100.0	11.3	8.4	26.7	53.6
Ashtabula Township	100.0	12.0	9.3	48.2	30.5
Ashtabula City	100.0	2.7	4.1	22.3	70.9
Saybrook Township	100.0	7.3	7.7	42.6	42.4
Regional Study Area	100.0	7.0	6.1	26.7	60.2

Source: *1970 Census of Housing*, U. S. Department of Commerce, Bureau of the Census.

Ashtabula has an older housing inventory than Conneaut. In Ashtabula, 71 percent of the 1970 stock was built before 1940 and only three percent since 1965. The localities with the youngest inventories are those with the higher housing values (i.e., Ashtabula and Saybrook Townships). In Ashtabula Township, only 30 percent of the year-round stock was built prior to 1940 and 12 percent since 1965. The proportions for Saybrook are 42 percent and seven percent, respectively. The housing stock in the Ohio Regional Study Area is on the average newer than in the cities of Conneaut and Ashtabula, but older than in the townships of Saybrook and Ashtabula. In addition to the age of the housing stock, the structural condition of the units is an important characteristic. However, data on the structural condition of a locality's housing stock are scarce and not always consistent. In 1976, the Ashtabula County Planning Commission, with the cooperation of the Ashtabula County Building Inspection Department, conducted a survey of the housing stock in the county. (Housing Study Ashtabula County, Ashtabula County Planning Commission, June 1977). The structures in the stock were rated from A to F, with the following definitions:

A-EXCELLENT: The house in this category is usually new (less than 10 years old) and in especially good condition.
B-GOOD: The house in this category is usually an older home (10 years or more) and has been kept in good repair.
C-GOOD: The house in this category is in average condition. It can be an old or new house in generally good repair, but it might need some paint and service repairs.
D-POOR: The house in this category usually needs some repairs, most of which are minor, and usually has no structural deficiencies.
E-POOR: The house in this category needs major repairs and usually has structural deficiencies.
F-DEMOLITION: The house in this category is a potential for demolition because reconstruction costs would be prohibitive due to the great number of structural deficiencies.

The survey results indicated that the county's housing was in good structural condition. Only one percent was not suitable for repair, two percent needed major work, the remaining 97 percent was sound. According to the survey, the condition of housing in the Ohio Coastal Communities was similar to that in the rest of Ashtabula County. In the cities of Conneaut and Ashtabula, two percent of the stock was not suitable for rehabilitation, in Ashtabula, Saybrook, and Kingsville Townships the proportion was less than one percent.

Indicators of Overcrowded Housing

2.141
The average number of persons per room is a useful statistical indicator of the extent of crowded conditions in existing housing. Units having 1.01 or more persons per room is the standard defined by the Census Bureau as the dividing line between acceptable and crowded occupancy. In the calculation of this ratio, the Bureau of the Census excludes such rooms as bathrooms, foyers, utility rooms, or unfinished attics or basements. According to the data in Table 2-97, 199 units or 4.2 percent of the occupied housing stock in the city of Conneaut contain an average of more than one person per room. However, only 37 units (0.8 percent of the stock) contain more than 1.5 people per room. In comparison to the entire State of Ohio and the other Ohio Coastal Communities, the problem of crowded housing in the city of Conneaut appears to be less severe. In Ashtabula County, 5.8 percent of all occupied housing units had more than one person per room. Statewide, the percentage was 6.6 percent in 1970. There is little variation among the Ohio Coastal Communities in their rates of crowded housing. All the communities have between 4-6 percent of their housing units with more than one person per room. None of the communities have more than one percent of their units with more than 1.5 people per room.

Pennsylvania Regional Study Area

Value

2.142
The values of single-family homes in the Pennsylvania Study Area were similar to those in the Ohio Study Area. In the Pennsylvania Local Study Area of Springfield, 67 percent of owner-occupied houses were valued between $5,000 and $15,000 in 1970, and only one percent were over $35,000. The mean value was $12,740, the lowest among all areas (refer to Table 2-98). Rental costs in the Pennsylvania Regional Study Area are reported as monthly contract rents, as opposed to monthly gross rents. In Springfield, the mean contract rent was $58 per month in 1970, with about 95 percent of the units under $80 in monthly rents. The community with the highest average value for single-family homes was Fairview with an average of $28,600, 125 percent greater than in Springfield. In Fairview, 27 percent of all homes were valued over $35,000. Rental units were also in the higher price range in Fairview, though not as high as in Millcreek. In Fairview, monthly rents averaged $91, while in Millcreek they averaged $120. Housing values in the Pennsylvania Principal and Regional Study Areas were, on the average, greater than in Springfield but below Fairview and Millcreek. In the Principal Study Area, the value of single-family homes averaged $17,030; monthly

Table 2-97

Average Number of Persons Per Room in Occupied Housing in the Ohio Regional Study Area--1970

	Number of Units With				Percent		
	1.0 Person Per Room Or Fewer	1.01-1.50 Person Per Room	1.51 Or More Person Per Room	Total	1.00 Or Fewer	1.01 To 1.50	1.51 Or More
Local Study Area							
Conneaut City	4,590	162	37	4,789	95.8	3.4	0.8
Principal Study Area							
Kingsville Township & Village	1,098	60	10	1,168	94.0	5.1	0.9
Ashtabula Township	2,228	114	14	2,356	94.6	4.8	0.6
Ashtabula City	7,152	385	71	7,608	94.0	5.1	0.9
Saybrook Township	1,958	73	15	2,046	95.7	3.6	0.7
Regional Study Area	28,228	1,439	286	29,953	94.2	4.8	1.0

Source: 1970 Census of Housing, U. S. Department of Commerce, Bureau of the Census.

Table 2-98

Value of Housing Inventory in the Pennsylvania Regional Study Area -- 1970

	Percent of Total Units					
	Local Study Area	Principal Study Area	Girard Area	Fairview Township & Borough	Millcreek Township	Regional Study Area
Owner-Occupied Single-Family Units						
Less than $5,000	7.7%	2.7%	3.3%	0.9%	1.3%	3.7%
5-10,000	34.0	20.0	22.1	6.5	7.3	22.2
10-15,000	33.0	28.9	30.4	16.2	19.6	28.3
15-20,000	14.2	23.1	23.7	18.2	26.3	22.1
20-25,000	6.5	11.6	9.9	12.7	18.0	11.1
25-35,000	3.1	8.9	8.0	18.9	18.2	8.2
35-50,000	1.0	3.5	2.1	17.3	7.1	3.2
Over $50,000	0.5	1.3	0.5	9.3	3.2	1.2
Mean Value	$12,740	$17,030	$15,670	$28,600	$22,590	$16,470
Renter-Occupied Units						
Less than $40[1]	16.0%	8.7%	14.5%	10.7%	5.5%	9.9%
40-60	36.2	26.3	23.4	10.7	9.5	27.9
60-80	42.0	29.2	27.3	23.1	16.5	30.0
80-100	5.8	14.8	16.4	18.3	12.3	14.5
100-120	-	8.6	11.4	17.7	13.9	7.3
120-150	-	6.5	6.4	11.8	11.5	5.4
150-200	-	4.7	0.3	5.3	24.6	4.0
Over $200	-	1.2	0.3	2.4	6.2	1.0
Mean Value	$58	$78	$76	$91	$120	$77

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(1) Monthly gross rent

Source: 1970 Census of Housing, U.S. Department of Commerce, U.S. Bureau of the Census.

rents averaged $78. Housing values in the Regional Study Area were slightly less with the average for a single-family home at $16,470 and average rents of $77. As with Ohio, data on average housing values since 1970 are not available. Although Pennsylvania is in the Northeast Region, (based on Bureau of Census definitions) the housing characteristics of the Pennsylvania Regional Study Area are more similar to those of Ohio and the North Central Region. In the North Central Region, the average value of single-family homes increased 65 percent from 1970 to 1975 while average contract rents increased 40 percent. Assuming these rates of increase, the average value of owner-occupied single-family homes is estimated at $27,200 in 1975 for the Pennsylvania Regional Study Area, while contract rents averaged close to $110 per month.

Plumbing Facilities

2.143
The percentages of units in the Pennsylvania Regional Study Area equipped with the necessary plumbing facilities are shown in Table 2-99. As expected, the more rural areas with lower housing values have relatively more units lacking one or more of the plumbing facilities defined earlier in this section. Springfield, for example, has the highest percentage (11 percent) of units lacking plumbing facilities. In Millcreek and Fairview, only two percent of year-round units lack plumbing facilities, well below the State average of five percent and the averages for the Principal and Regional Study Areas of three percent and four percent, respectively.

Age and Condition of the Housing Inventory

2.144
The housing stock in the Pennsylvania Regional Study Area is relatively new. The age distribution, for areas where data were available, is presented in Table 2-100. The newest housing stock is in Millcreek. Quality of the existing housing stock in Springfield Township and East Springfield Borough has been classified as follows:

1) Sound -- no lack of basic physical features and no significant deficiencies that could not be corrected with minor improvements or repair.
2) Deteriorating -- One or more major structural deficiencies (roof, foundation, exterior walls, etc.); or a combination of minor deficiencies in sufficient number and extent to necessitate repair. Rehabilitation is economically feasible.
3) Dilapidated -- A lack of basic facilities or major deficiencies so numerous that unit is unsafe and beyond economical repair.

Table 2-99

Plumbing Facilities in Housing Inventory in the Pennsylvania Regional Study Area--1970

	Percent of Year-Round Units	
	With All Plumbing Facilities	Lacking One or More Plumbing Facilities
Local Study Area		
Springfield Township & East Springfield Borough	89.0%	11.0%
Principal Study Area	96.7	3.3
Girard Area	95.9	4.1
Fairview Township & Borough	97.6	2.4
Millcreek Township	98.4	1.6
Regional Study Area	95.8	4.2

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

Table 2-100

Age of Housing Inventory in the Pennsylvania Regional Study Area -- 1970

(Percent of All Year-Round Units)

	Built 1965-1970	1960 to 1965	1940 to 1960	Prior to 1940	Mean Age in 1970 (Years)
Girard Area	12.0%	7.5%	26.2%	54.3%	28
Millcreek Township	19.1	12.0	49.3	19.6	19
Principal Study Area	8.2	6.4	31.1	54.3	29
Regional Study Area	8.5	6.1	26.8	58.6	29

Source: 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census.

The Springfield housing inventory is in very good exterior condition. Only 28 substandard units were found to exist in the area; this is less than two percent of the area's inventory. These superior housing conditions have been attributed to three factors: (2-4)

1) The high rate of home ownership - 81 percent,
2) The average family income of the area's population is at a healthy level, and
3) The relatively young age of its housing.

Data on housing conditions in Crawford County indicate a much poorer housing quality in Crawford County than reported for Springfield. (2-5) For the entire country in 1976, 64 percent of all units were sound, 25 percent were deteriorating, and 11 percent dilapidated. In the Crawford County portion of the Pennsylvania Principal Study Area, conditions were worse with only 51 percent classified as sound, but 34 percent deteriorating, and 15 percent dilapidated.

2.145
Approximately 7.9 percent of the Pennsylvania Local Study Area's occupied housing units contain an average of more than one person per room and of these 1.7 percent contain more than 1.5 people per room. These percentages point to a higher probability of overcrowding than in any of the Ohio and Pennsylvania Coastal Communities. In the Erie County portion of the Principal Study Area, six percent of occupied units had more than one person per room but with only 0.8 percent over 1.5 people per room. Data on the average number of people per room of occupied housing is presented in Table 2-101. The lowest occurrence of overcrowded housing is in Fairview and Millcreek where 4.4 percent and 4.9 percent of occupied units have more than one person per room, respectively. These relatively low percentages correlate well with the higher than average housing values in these two communities.

c) Housing Growth -- 1970-1975

2.146
Data available on housing permits issued from 1970 to 1975 were utilized to indicate recent growth in housing activity in the Regional Study Area. Permit data are good indicators of new housing activity, since 100 percent of Ashtabula and Crawford Counties and 95 percent of Erie County are regulated by building permit programs.

Ohio Regional Study Area

2.147
The statistics on building permits issued between 1970-1975 in the Ohio Regional Study Area are presented in Table 2-102. It is evident

Table 2-101

Average Number of Persons Per Room in Occupied Housing in the Pennsylvania Regional Study Area--1970

	Number of Units with				Percent		
	1.0 Person Or Fewer Per Room	1.01-1.50 Person Per Room	1.51 Or More Person Per Room	Total	1.00 Or Fewer	1.01 To 1.50	1.51 Or More
Local Study Area							
Springfield Township & East Springfield Borough	806	54	15	875	92.1%	6.2%	1.7
Principal Study Area							
Girard Area	2296	133	23	2454	93.7	5.4	0.9
Fairview Township & Borough	1980	86	5	2071	95.6	4.2	0.2
Millcreek Township	10,366	461	80	10,907	95.1	4.2	0.7
Principal Study Area	65,046	3591	566	69,203	94.0	5.2	0.8
Regional Study Area	98,549	5021	863	104,433	94.4	4.8	0.8
Erie County	74,600	4003	646	79,249	94.1	5.1	0.8
Crawford County	23,949	1018	217	25,184	95.1	4.0	0.9

Source: 1970 Census of Housing, U. S. Department of Commerce, Bureau of Census.

Table 2-102

Housing Permits Issued in the Ohio Regional Study Area--1970-1975

	1970	1971	1972	1973	1974	1975	Total 1970-1975
Local Study Area							
Conneaut City	4	30	N/A	N/A	25	13	N/A
Principal Study Area	15	38	46	49	24	29	201
North Kingsville Village	146	40	55	55	25	87	408
Ashtabula City	368	408	460	457	395	402	2,490
Regional Study Area	59	87	86	61	42	39	374
Ohio (thousand units)	1,384	1,953	2,239	1,830	1,088	949	9,443
United States (thousand units)							
	Percent of 1970 Housing Inventory						
Local Study Area							
Conneaut City	0.1%	0.6%	N/A	N/A	0.5%	0.3%	N/A
Principal Study Area	2.0	5.1	6.2	6.6	3.2	3.9	26.9
North Kingsville Village	1.8	0.5	0.7	0.7	0.3	1.1	5.2
Ashtabula City	1.1	1.3	1.4	1.4	1.2	1.2	7.7
Regional Study Area	1.7	2.5	2.5	1.8	1.2	1.1	10.8
Ohio	2.0	2.9	3.3	2.7	1.6	1.4	13.9
United States							

N/A = Not Available.

Source: U.S. Department of Commerce, Bureau of the Census.

that the Ohio Regional Study Area experiences significant cyclicality in housing activity similar to the United States. However, increases in 1975 in all the areas, except Conneaut, indicate that the cyclicality is less severe in the Regional Study Area than in the State of Ohio or in the United States. New housing growth since 1970 has been most strong in North Kingsville. From 1970 to 1975, the number of permits issued for new housing was equal to 27 percent of the 1970 housing inventory in North Kingsville. For each of the other areas (where data were available) the total number of permits issued during 1970-1975 represented a small fraction of the 1970 housing stock. The number of permits issued relative to the total housing stock in these communities was also below the Ohio State average where new housing stock added during 1970-1975 was equivalent to 11 percent of the stock. For the United States growth was even higher, as permits issued during 1970-1975 accounted for 14 percent of the stock.

Pennsylvania Regional Study Area

2.148
Data on new housing permits available for communities in the Pennsylvania Study Area are shown in Table 2-103. The strongest growth in new housing occurred in Millcreek, with Fairview a close second. In Millcreek, new housing permits issued during the 1970-1975 period equaled 24 percent of the 1970 housing inventory in the township, while in Fairview they comprised 21 percent. Growth in new housing, measured by the number of permits issued, was higher on average for localities in the Principal and Regional Study Areas than for the entire state.

d) Housing Forceasts

2.149
Housing forecasts for the Regional Study Area represent demand forecasts based on expected new household formations, vacancy requirements, and removals from the stock of existing units. The stock of housing in any given forecast year will be equal to the existing stock plus net additions during the year. The level of net additions is largely determined by the number of new households created, plus new units necessary to maintain certain vacancy levels, less removals from the stock of existing units. Forecasts of households are based on published estimates of average household size in the United States. (2-6) Average household sizes for the Regional Study Area were based on the percentage changes in household size from 1975 to 1990. These forecasts show a continuing trend towards smaller households, but the rate of decrease is expected to level off in the forecast period. From 1970 to 1975, average household size declined 6.5 percent. The forecasts show a 5.4 percent decline from 1975 to 1980, 5.3 percent from 1980 to 1985, and a 1.9 percent decline from 1985 to

Table 2-103

Housing Permits Issued in the Pennsylvania Regional Study Area--1970-1975

	1970	1971	1972	1973	1974	1975	Total 1970-1975
Local Study Area							
Springfield (1)	N/A	17	16	16	2	6	57
Principal Study Area							
Girard Area (2)	26	60	55	46	35	39	261
Fairview Township & Borough	71	117	117	63	58	39	465
Millcreek Township	454	737	570	395	246	298	2,700
Regional Study Area	1,512	2,549	3,293	1,975	1,558	1,347	12,134
Pennsylvania (thousand units)	41	55	63	60	39	33	291

Percent of 1970 Housing Inventory

	1970	1971	1972	1973	1974	1975	Total 1970-1975
Local Study Area							
Springfield (1)	N/A	2.3%	2.2%	2.2%	0.3%	0.8%	N/A
Principal Study Area							
Girard (2)	1.1	2.5	2.3	1.9	1.4	1.6	10.7
Fairview Township & Borough	3.2	5.3	5.3	2.8	2.6	1.8	21.0
Millcreek Township	4.0	6.5	5.0	3.5	2.2	2.6	23.8
Regional Study Area	1.4	2.3	3.0	1.7	1.4	1.2	11.0
Pennsylvania (thousand units)	1.1	1.4	1.6	1.5	1.0	0.9	7.5

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(1) Excludes East Springfield Borough

(2) Excludes Platea Borough

N/A = Not Available.

Source: U.S. Department of Commerce, Bureau of the Census.

1990. By dividing the forecasts of total population by the estimates of household size, the number of households for the forecast period were derived. Growth in the number of new households was the basis for estimating new housing demand, since a household by Census definition is an occupied housing unit. Household forecasts for the Ohio and Pennsylvania Regional Study Areas are presented in Tables 2-104 and 2-105, respectively. Housing removals are a difficult component of housing demand to analyze and forecast. Removals include those units converted to another use by their owners; destroyed by fire; demolished through public action such as urban renewal, code enforcement or highway construction; units demolished because of poor physical condition or to make room for commercial or industrial expansion. Accurate or complete records of removals are not available. Therefore, it was necessary to rely upon estimates derived from the 1960-1970 removal experience and judgments about future removals in order to derive a forecast. Historically, annual removals have accounted for one percent of the existing housing inventory in the United States. This rate was decreased slightly to 0.9 percent over the forecast period since more remodeling and rehabilitation work is being undertaken instead of demolitions. Vacancy requirements are assumed to remain at 1970 levels.

Ohio Regional Study Area

2.150
The new construction and housing inventory forecasts for the Ohio Study Area are presented in Table 2-106. Most new construction is expected to take place during the 1980 to 1985 period, since the rate of new household formations is expected to be high. The exception is in Ashtabula City, where forecasts of a decline in population over the 1975 to 1990 period should cause slow growth in households from 1980 to 1985 and a decline in total households from 1985 to 1990. For the city of Conneaut, total housing inventory is expected to grow 1.2 percent annually, the same rate as forecasted for the Regional Study Area. Higher growth areas are expected in Kingsville and Saybrook Townships where housing inventories are estimated to increase at an annual rate of 2.5 percent and 2.4 percent, respectively. Ashtabula County Planning Commission forecasts show annual new housing needs of 695 units over the 1977 to 1990 period. (2-7) However, estimates prepared by the applicant's consultant indicate that 770 new units will be required annually over the 1975 to 1990 period, or 10 percent more than the Astabula County Planning Commission estimates. The major difference in the two forecasts is in the removal component. These estimates are presented in Table 2-106. Using the 0.9 percent removal rate assumption, annual removals in Ashtabula County average 290 units. On the other hand, the Planning Commission forecasts annual replacement of housing due to losses at only 35 units and annual replacements of substandard units

Table 2-104

Household Forecasts for the Ohio Regional Study Area

	Number of Households				Persons Per Household			
	1975	1980	1985	1990	1975	1980	1985	1990
Local Study Area								
Conneaut City	5,176	5,595	6,059	6,320	2.84	2.69	2.55	2.50
Principal Study Area								
Kingsville Township	1,403	1,625	1,867	2,058	3.35	3.17	3.00	2.94
Ashtabula Township	2,568	2,821	3,094	3,269	2.96	2.80	2.65	2.60
Ashtabula City	8,127	8,286	8,433	8,232	2.99	2.83	2.68	2.63
Saybrook Township	2,198	2,561	2,976	3,309	3.05	2.89	2.74	2.69
Regional Study Area	33,255	35.879	38,868	40,517	3.07	2.91	2.76	2.71

Source: Arthur D. Little, Inc. estimates based on data from U.S. Department of Commerce, Bureau of the Census.

Table 2-105

Household Forecasts for the Pennsylvania Regional Study Area

	Number of Households				Persons Per Household			
	1975	1980	1985	1990	1975	1980	1985	1990
Local Study Area								
Springfield Township & East Springfield Borough	991	1,111	1,284	1,404	3.23	3.06	2.90	2.85
Principal Study Area	82,695	90,410	99,025	104,410	3.10	2.93	2.77	2.72
Girard Area	2,839	3,208	3,709	4,099	3.10	2.93	2.77	2.72
Fairview Township & Borough	2,374	2,773	3,224	3,587	3.58	3.39	3.21	3.15
Millcreek Township	12,381	13,859	15,230	16,464	3.15	2.98	2.82	2.77
Regional Study Area	116,156	127,423	138,913	146,273	3.07	2.91	2.76	2.71

Source: Arthur D. Little, Inc. estimates based on data from U.S. Department of Commerce, Bureau of the Census.

Table 2-106

Forecasts of Housing in the Ohio Regional Study Area

(Year-round Housing Units)

		New Additions			Removals		
	1975 Inventory	1975 to 1980	1980 to 1985	1985 to 1990	1975 to 1990	1990 Inventory	Annual Average Growth in Housing Inventory 1975 to 1990 (%)
Local Study Area							
Conneaut City	5,600	645	690	485	675	6,745	1.2%
Principal Study Area							
Kingsville Township & Village	1,465	270	290	240	150	2,115	2.5
Ashtabula Township	2,620	355	375	275	300	3,325	1.6
Ashtabula City	8,460	510	495	150	1,050	3,565	0.1
Saybrook Township	2,570	465	515	435	300	3,685	2.4
Regional Study Area	35,685	4,010	4,450	3,090	4,350	42,885	1.2

Source: Arthur D. Little, Inc. estimates.

at 30 units; a total of only 65 units per year. The Planning Commission's estimates for yearly losses were based on estimates from fire departments and building inspection departments in the county. The two forecasts with a 10 percent discrepancy over a 15-year period are not too divergent.

Pennsylvania Regional Study Area

2.151
The housing forecasts for the Pennsylvania Regional Study Area are shown in Table 2-107. As in Ohio, the 1980 to 1985 period shows the highest demand for new housing. In the Pennsylvania Local Study Area, the housing inventory is expected to grow at 2.3 percent annually over the 1975 to 1990 period. This is a higher forecast than for the entire Principal or Regional Study Areas, which are both expected to grow at 1.5 percent per year over the same period. The difference is attributable to the baseline population and household forecasts. Among the Pennsylvania Coastal Communities, Fairview shows the highest rate of growth in its inventory of housing: 2.6 percent per year. This is probably due to the community's high rate of population and household growth relative to the other communities in the area. The Erie Metropolitan Planning Department (EMPD) 1974 housing forecasts (2-8) for 1973-1983 indicate substantial agreement with forecasts shown in Table 2-107. For Girard, Fairview, and Millcreek, the EMPD housing forecasts show an annual average need of 639 units over the 1973 to 1983 period; forecasts in Table 2-107 for the same locations imply new housing demand at 605 units per year over the 1975 to 1985 period. The difference can be attributed to the use of EMPD's higher forecast of household growth in Millcreek.

Methodology for Projecting Baseline Housing by Unit Type

2.152
The projection of total housing units is based on the number of household formations as developed in the Population baseline section. This forecast was then adjusted so as to correspond to the local vacancy rate observed in the 1970 Census of Housing (refer to Table 2-90) which is assumed to remain constant. These totals were divided into three housing types: single family, multi-family, and mobile homes as follows.

2.153
The total number of units for single- and multi-family units are projected as the residual between total units less mobile home projections. The split between single- and multi-family total units was made based on a review of the 1970 housing composition and the likely trend of new housing demand by type. Proportions used for distribution of the incremental units between single- and multi-family homes for 11 study areas are shown in Table 2-108.

Table 2-107

Forecasts of Housing in the Pennsylvania Regional Study Area

(Year-round Housing Units)

	1975 Inventory	New Additions			Removals	1990 Inventory	Annual Average Growth in Housing Inventory 1975 to 1990 (%)
		1975 to 1980	1980 to 1985	1985 to 1990	1975 to 1990		
Local Study Area							
Springfield Township & East Springfield Borough	1,030	165	220	165	135	1,445	2.3%
Principal Study Area							
Girard Area	2,950	455	585	475	255	4,210	2.4
Fairview Township & Borough	2,540	520	570	485	360	3,755	2.6
Millcreek Township	12,865	2,005	1,895	1,755	1,575	16,945	1.9
Principal Study Area	86,995	11,365	12,265	9,035	10,950	108,710	1.5
Regional Study Area	122,895	16,415	16,640	12,510	15,450	153,010	1.5

Source: Arthur D. Little, Inc. estimates.

Table 2-108

Proportions Used for Projecting Single- and Multi-Family Housing Units

	Single-Family	Multi-Family
Conneaut	70%	30%
Kingsville Township and Village	90	10
Ashtabula Township	90	10
Ashtabula City	50	50
Saybrook Township	90	10
Other Ohio Principal Study Area	90	10
Springfield Township and East Springfield Borough	90	10
Girard Area	85	15
Fairview Township and Borough	90	10
Millcreek Township	75	25
Other Pennsylvania Principal Study Area	70	30

Source: U.S. Bureau of the Census, 1970 Census of Housing; Ashtabula County Planning Commission; Erie County Planning Commission; New Residential Housing Requirements Working Paper.

Mobile Home Units

2.154
It was assumed that the number of mobile homes in trailer parks would reach their present level of full expansion potential in 1990. Data for years between 1975 and 1990 were interpolated, rounding to the nearest multiple of five. Since mobile home unit potential had been derived only for the Coastal Communities, project figures were estimated by applying the growth rate between 1970 and 1990 in the coastal area to the remainder of the Principal Study Area.

2.155
Ashtabula City. This community is characterized by low population growth projections from 1975 to 1985 and an actual decline in population between 1985 and 1990. This fact translates into a decline in the existing 1985 housing stock by a total of 200 units. A projected increase of 80 mobile homes during the declining forecast period means that a total of 280 units are removed between 1985 and 1990 in the single and multi-family housing types. It is assumed that 75 percent of this decline would be in single family housing and 25 percent in multi-family, the proportions of these two housing types found in the stock in 1970 (refer to Table 2-109).

2.156
Total Principal Study Area. For the total Principal Study Area, the projections imply a small shift from a 1970 breakdown by housing unit type of approximately 73 percent single-family, 23 percent multi-family, and 3 percent mobile home units to the 1990 breakdown of 71 percent single-family, 23 percent multi-family, and 5 percent mobile home units. A slight decline in the percentage of single-family, with a slight rise in mobile home units is assumed, while multi-family units are about constant.

Education Services

a) General Education

School District Structure

2.157
The Coastal Communities contain seven school districts. Those in the Ohio Coastal Communities are Conneaut Area City, Buckeye Local, and Ashtabula Area City. Conneaut Area City and Ashtabula Area City largely comprise densely settled, urbanized population areas, while the Buckeye Local School District is a more suburban community. The school districts in the Pennsylvania Coastal Communities include Northwestern, Girard, Fairview, and Millcreek. Northwestern is the largest in area of the four and the most sparsely populated.

Table 2-109

Baseline Housing Projections in the Ohio and Pennsylvania Principal Study Areas

Local Study Area		Single-Family			Multi-Family			Mobile Homes			Total		
		Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent
Conneaut	1979	4,670	60	79%	995	20	17%	260	15	4%	5,925	95	100%
	1980	4,730	60	79	1,015	20	17	275	15	4	6,020	95	100
	1981	4,785	55	78	1,040	25	17	290	15	5	6,115	95	100
	1982	4,840	55	78	1,065	25	17	305	15	5	6,210	95	100
	1983	4,890	50	78	1,085	20	17	320	15	5	6,295	85	100
	1984	4,945	55	77	1,110	25	18	335	15	5	6,390	95	100
	1985	5,000	55	77	1,135	25	18	350	15	5	6,485	95	100
	1986	5,025	25	77	1,145	10	18	365	15	5	6,535	50	100
	1987	5,050	25	77	1,155	10	18	380	15	6	6,585	50	100
	1988	5,080	30	76	1,165	10	18	400	20	6	6,645	60	100
	1989	5,105	25	76	1,175	10	18	415	15	6	6,695	50	100
	1990	5,130	25	76	1,185	10	18	430	15	6	6,745	50	100
Springfield	1979	895	30	80	75	5	7	140	5	13	1,110	40	100
	1980	925	30	80	80	5	7	145	5	13	1,150	40	100
	1981	955	30	80	85	5	7	150	5	13	1,190	40	100
	1982	985	30	81	85	0	7	150	0	12	1,220	30	100
	1983	1,010	25	81	90	5	7	155	5	12	1,255	35	100
	1984	1,040	30	81	90	0	7	155	0	12	1,285	30	100
	1985	1,070	30	81	95	5	7	160	5	12	1,325	40	100
	1986	1,090	20	81	95	0	7	165	5	12	1,350	25	100
	1987	1,105	15	80	100	5	7	170	5	12	1,375	25	100
	1988	1,125	20	81	100	0	7	170	0	12	1,395	20	100
	1989	1,140	15	80	105	5	7	175	5	12	1,420	25	100
	1990	1,160	20	80	105	0	7	180	5	13	1,445	25	100
Ohio Coastal Communities													
Kingsville	1979	1,435	40	88	135	5	8	70	0	4	1,640	45	100
	1980	1,475	40	88	140	5	8	70	0	4	1,685	45	100
	1981	1,520	45	88	145	5	8	70	0	4	1,735	50	100
	1982	1,560	40	88	150	5	8	70	0	4	1,780	45	100
	1983	1,605	45	88	155	5	9	70	0	3	1,830	50	100
	1984	1,645	40	88	160	5	9	70	0	3	1,875	45	100
	1985	1,690	45	88	165	5	9	70	0	3	1,925	50	100
	1986	1,725	35	88	170	5	9	70	0	3	1,965	40	100
	1987	1,760	35	88	175	5	9	70	0	3	2,005	40	100
	1988	1,790	30	88	175	0	9	70	0	3	2,035	30	100
	1989	1,825	35	88	180	5	9	70	0	3	2,075	40	100
	1990	1,860	35	88	185	5	9	70	0	3	2,115	40	100

Table 2-109 (Continued)

		Single-Family			Multi-Family			Mobile Homes			Total		
		Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent
Ashtabula Township	1979	2,325	45	82%	170	5	6%	330	0	12%	2,825	50	100%
	1980	2,370	45	82	175	5	6	330	0	12	2,875	50	100
	1981	2,420	50	83	180	5	6	330	0	11	2,930	55	100
	1982	2,470	50	83	185	5	6	330	0	11	2,985	55	100
	1983	2,525	55	83	190	5	6	325	0	11	3,040	60	100
	1984	2,575	50	83	195	5	6	325	0	11	3,095	55	100
	1985	2,625	50	83	200	5	6	325	0	10	3,150	55	100
	1986	2,655	30	83	205	5	6	325	0	10	3,185	35	100
	1987	2,690	35	83	210	5	7	325	0	10	3,225	40	100
	1988	2,720	30	84	210	0	7	320	0	10	3,250	30	100
	1989	2,755	35	84	215	5	7	320	0	10	3,290	40	100
	1990	2,785	30	84	220	5	7	320	0	10	3,325	35	100
Ashtabula City	1979	6,095	10	71	2,240	5	26	255	15	3	8,590	30	100
	1980	6,105	10	71	2,245	5	26	270	15	3	8,620	30	100
	1981	6,110	5	71	2,250	5	26	285	15	3	8,645	25	100
	1982	6,115	5	71	2,260	10	26	300	15	3	8,675	30	100
	1983	6,125	10	70	2,265	5	26	320	20	4	8,710	35	100
	1984	6,130	5	70	2,275	10	26	335	15	4	8,740	30	100
	1985	6,135	5	70	2,280	5	26	350	15	4	8,765	25	100
	1986	6,095	0	70	2,265	0	26	365	15	4	8,725	15	100
	1987	6,050	0	70	2,250	0	26	380	15	4	8,680	15	100
	1988	6,010	0	70	2,240	0	26	400	20	4	8,650	20	100
	1989	5,965	0	70	2,225	0	26	415	15	4	8,605	15	100
	1990	5,925	0	70	2,210	0	26	430	15	4	8,565	15	100
Saybrook	1979	2,570	60	90	170	5	6	125	5	4	2,865	70	100
	1980	2,630	60	90	175	5	6	130	5	4	2,935	70	100
	1981	2,700	70	90	185	10	6	135	5	4	3,020	85	100
	1982	2,770	70	90	190	5	6	140	5	4	3,100	80	100
	1983	2,845	75	90	200	10	6	140	0	4	3,185	85	100
	1984	2,915	70	90	205	5	6	145	5	4	3,265	80	100
	1985	2,985	70	90	215	10	6	150	5	4	3,350	85	100
	1986	3,040	55	90	220	5	6	155	5	4	3,415	65	100
	1987	3,095	55	89	225	5	6	160	5	5	3,480	65	100
	1988	3,155	60	89	235	10	6	165	5	5	3,555	75	100
	1989	3,210	55	89	240	5	6	170	5	5	3,620	65	100
	1990	3,265	55	89	245	5	6	175	5	5	3,685	65	100

Table 2-109 (Continued)

		Single-Family			Multi-Family			Mobile Homes			Total		
		Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent
Remaining Ohio Principal Study Area	1979	4,720	60	85%	490	5	9%	355	10	6%	5,565	75	100%
	1980	4,780	60	85	495	5	9	365	10	6	5,640	75	100
	1981	4,980	200	85	505	10	9	375	10	6	5,860	220	100
	1982	5,180	200	85	515	10	9	390	15	6	6,085	225	100
	1983	5,385	205	85	520	5	9	400	10	6	6,305	220	100
	1984	5,585	200	86	530	10	8	415	15	6	6,530	225	100
	1985	5,785	200	86	540	10	8	425	10	6	6,750	220	100
	1986	5,710	0	85	545	5	8	435	10	7	6,690	15	100
	1987	5,635	0	85	550	5	8	450	15	7	6,635	20	100
	1988	5,560	0	85	555	5	8	460	10	7	6,575	15	100
	1989	5,485	0	84	560	5	9	475	15	7	6,520	20	100
	1990	5,410	0	84	565	5	9	485	10	7	6,460	15	100
Ohio Principal Study Area	1979	21,815	275	79	4,200	45	16	1,395	45	5	27,410	365	100
	1980	22,090	275	80	4,265	45	15	1,420	45	5	27,775	365	100
	1981	22,515	425	80	4,305	60	15	1,485	45	5	28,305	530	100
	1982	22,935	420	80	4,365	60	15	1,535	50	5	28,835	530	100
	1983	23,375	440	80	4,415	50	15	1,575	45	5	29,365	535	100
	1984	23,795	420	80	4,475	60	15	1,625	50	5	29,895	530	100
	1985	24,220	425	80	4,535	60	15	1,670	45	5	30,425	530	100
	1986	24,250	145	80	4,550	30	15	1,715	45	5	30,515	220	100
	1987	24,280	150	80	4,565	30	15	1,765	50	5	30,610	230	100
	1988	24,315	150	80	4,580	25	15	1,815	55	5	30,710	230	100
	1989	24,345	150	80	4,595	30	15	1,865	50	5	30,805	230	100
	1990	24,375	145	79	4,620	30	15	1,910	45	6	30,905	220	100
Pennsylvania Coastal Communities													
Girard	1979	2,445	75	76	380	15	12	390	15	12	3,215	105	100
	1980	2,520	75	76	395	15	12	405	15	12	3,320	105	100
	1981	2,595	75	76	410	15	12	420	15	12	3,425	105	100
	1982	2,665	70	76	420	10	12	435	15	12	3,520	95	100
	1983	2,740	75	76	435	15	12	445	10	12	3,620	100	100
	1984	2,810	70	76	445	10	12	460	15	12	3,715	95	100
	1985	2,885	75	76	460	15	12	475	15	12	3,820	105	100
	1986	2,940	55	75	470	10	12	490	15	13	3,900	80	100
	1987	2,995	55	75	480	10	12	500	10	13	3,975	75	100
	1988	3,050	55	75	490	10	12	515	15	13	4,055	80	100
	1989	3,105	55	75	500	10	12	525	10	13	4,130	75	100
	1990	3,160	55	75	510	10	12	540	15	13	4,210	80	100

Table 2-109 (Continued)

		Single-Family			Multi-Family			Mobile Homes			Total		
		Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent
Fairview	1979	2,630	80	92%	155	10	5%	65	0	3%	2,850	90	100%
	1980	2,710	80	92	165	10	6	65	0	2	2,940	90	100
	1981	2,790	80	92	175	10	6	65	0	2	3,030	90	100
	1982	2,870	80	92	185	10	6	65	0	2	3,120	90	100
	1983	2,950	80	92	190	5	6	65	0	2	3,205	85	100
	1984	3,030	80	92	200	10	6	65	0	2	3,295	90	100
	1985	3,110	80	92	210	10	6	65	0	2	3,385	90	100
	1986	3,175	65	92	215	5	6	65	0	2	3,455	70	100
	1987	3,240	65	92	225	10	6	65	0	2	3,530	75	100
	1988	3,310	70	92	230	5	6	70	5	2	3,610	80	100
	1989	3,375	65	92	240	10	6	70	0	2	3,685	75	100
	1990	3,440	65	92	245	5	6	70	0	2	3,755	70	100
Millcreek	1979	11,280	170	80	1,745	55	12	1,045	50	8	14,070	275	100
	1980	11,450	170	79	1,800	55	13	1,095	50	8	14,345	275	100
	1981	11,620	170	79	1,855	55	13	1,145	50	8	14,620	275	100
	1982	11,790	170	79	1,910	55	13	1,195	50	8	14,895	275	100
	1983	11,955	165	79	1,970	60	13	1,240	45	8	15,165	270	100
	1984	12,125	170	79	2,025	55	13	1,290	50	8	15,440	275	100
	1985	12,295	170	78	2,080	55	13	1,340	50	9	15,715	275	100
	1986	12,445	150	78	2,130	50	13	1,390	50	9	15,965	250	100
	1987	12,590	145	78	2,180	50	13	1,440	50	9	16,210	245	100
	1988	12,740	150	77	2,225	45	14	1,485	45	9	16,450	240	100
	1989	12,885	145	77	2,275	50	14	1,535	50	9	16,695	245	100
	1990	13,035	150	77	2,325	50	14	1,585	50	9	16,945	250	100
Remaining Pennsylvania Principal Study Area	1979	48,110	800	67	21,640	345	30	1,980	80	3	71,730	1,225	100
	1980	48,910	800	67	21,985	345	30	2,060	80	3	72,955	1,225	100
	1981	49,710	800	67	22,330	345	30	2,140	80	3	74,180	1,225	100
	1982	50,515	805	67	22,675	345	30	2,225	85	3	75,415	1,235	100
	1983	51,315	800	67	23,015	340	30	2,305	80	3	76,635	1,220	100
	1984	52,120	805	67	23,360	345	30	2,390	85	3	77,870	1,235	100
	1985	52,920	800	67	23,705	345	30	2,470	80	3	79,095	1,225	100
	1986	53,320	400	67	23,875	170	30	2,550	80	3	79,745	650	100
	1987	53,720	400	67	24,045	170	30	2,635	85	3	80,400	655	100
	1988	54,115	395	67	24,220	175	30	2,715	80	3	81,050	650	100
	1989	54,515	400	67	24,390	170	30	2,800	85	3	81,705	655	100
	1990	54,915	400	67	24,560	170	30	2,880	80	3	82,355	650	100

Table 2-109 (Continued)

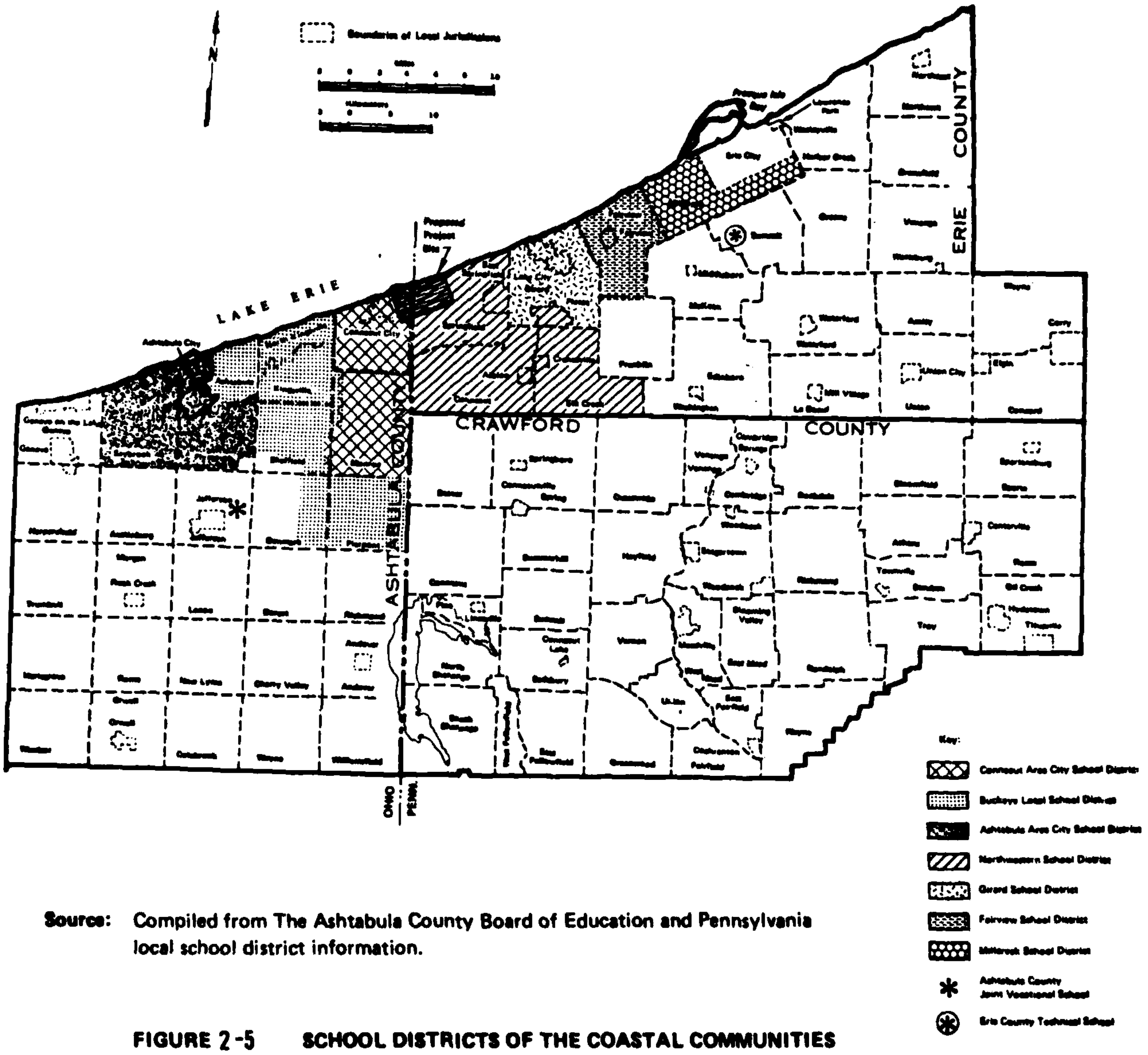
		Single-Family			Multi-Family			Mobile Homes			Total		
		Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent	Demand	New Units Required	Percent
Pennsylvania Principal Study Area	1979	65,360	1,155	70%	23,995	430	26%	3,620	150	4%	92,975	1,735	100%
	1980	66,515	1,155	70	24,425	430	26	3,770	150	4	94,710	1,735	100
	1981	67,670	1,155	70	24,855	430	26	3,920	150	4	96,445	1,735	100
	1982	68,825	1,155	70	25,275	420	26	4,070	150	4	98,170	1,725	100
	1983	69,970	1,145	70	25,700	425	26	4,220	140	4	99,890	1,710	100
	1984	71,125	1,155	70	26,120	420	26	4,360	150	4	101,605	1,725	100
	1985	72,280	1,155	70	26,550	430	26	4,510	150	4	103,340	1,735	100
	1986	72,970	690	70	26,785	235	26	4,660	150	4	104,415	1,075	100
	1987	73,650	680	70	27,030	245	25	4,810	150	5	105,490	1,075	100
	1988	74,340	690	70	27,265	235	25	4,955	145	5	106,560	1,070	100
	1989	75,020	680	70	27,510	245	25	5,105	150	5	107,635	1,075	100
	1990	75,710	690	70	27,745	235	25	5,255	150	5	108,710	1,075	100
Total Principal Study Area	1979	87,175	1,430	72	28,195	475	23	5,015	195	5	120,385	2,100	100
	1980	88,605	1,430	72	28,670	475	23	5,210	195	5	122,485	2,100	100
	1981	90,185	1,580	72	29,160	490	23	5,405	195	5	124,750	2,265	100
	1982	91,760	1,575	72	29,640	480	23	5,605	200	5	127,005	2,255	100
	1983	93,345	1,585	72	30,115	475	23	5,785	185	5	129,245	2,245	100
	1984	94,920	1,575	72	30,595	480	23	5,985	200	5	131,500	2,255	100
	1985	96,500	1,580	72	31,085	490	23	6,180	195	5	133,765	2,265	100
	1986	97,220	835	72	31,335	265	23	6,375	195	5	134,930	1,295	100
	1987	97,930	830	72	31,595	275	23	6,575	200	5	136,100	1,305	100
	1988	98,655	840	72	31,845	260	23	6,770	200	5	137,270	1,300	100
	1989	99,365	830	72	32,105	275	23	6,970	200	5	138,440	1,305	100
	1990	100,085	835	72	32,355	265	23	7,165	195	5	139,605	1,295	100

Source: Table 2-108 Population baseline: Economics and Demographics Operations Phase Working Paper; Census of Housing (1970).

Similarly, Girard is largely rural; Fairview and Millcreek are suburban areas closer to Erie City. The boundaries of the seven school districts are shown in Figure 2-5 while the municipalities and townships constituting each are presented in Table 2-110. The four Pennsylvania districts follow township lines more closely than the three Ohio districts. The Millcreek and Fairview School District boundaries are coterminous with their respective township boundaries, while the Girard School District includes Girard Township and Borough and Lake City Borough. The Northwestern School District comprises four boroughs (East Springfield, Cranesville, Platea, and Albion) and three townships (Springfield, Conneaut, and Elk Creek). The Ohio School District boundaries cut across township lines and, in the case of Ashtabula City, even city lines are positioned between Ashtabula Area City and the Buckeye Local School Districts. The Conneaut Area and Northwestern School Districts are regarded as the Local Study Area and, as such, are discussed in greater detail than the remaining five school districts which are considered the Principal Study Area for the purpose of this section. Relative to the 1975 national average enrollment size of school districts, the school districts in the Coastal Communities rank in the upper third. Fifty-six percent of the nation's school districts enroll fewer than 1,000 pupils. (2-9) Within the Coastal Communities, enrollments range from 2,100 to 8,300. Excluding Ashtabula and Millcreek which serve the most populated areas, the school districts average about 2,800 pupils. School district enrollment in the Coastal Communities is shown in Table 2-111. The school districts are not expected to undertake extensive merger of educational services. A consolidation of school districts in the Coastal Communities occurred in the 1960's and current service areas are rather firmly established. Also established is the provision of certain services, supplementary to the local school districts, by the Ashtabula County Board of Education and the Northwest Tri-County Intermediate Unit. As a "local" rather than a "city" school district, Buckeye School District receives support services, such as financial reporting and analysis, from Ashtabula County, while Ashtabula Area City and Conneaut Area City Districts are self-contained. The four Pennsylvania school districts receive support from the Northwest TriCounty Intermediate Unit. The Intermediate Unit, which serves 17 school districts in a three-county area, provides special education, curriculum development, management assistance, and other resource services to the districts.

Enrollments

2.158
Enrollment trends and projections are considered in the context of total school-age enrollments. In the Coastal Communities, school-age children are distributed among general public, vocational public, and nonpublic schools. General public school enrollments comprise at



Source: Compiled from The Ashtabula County Board of Education and Pennsylvania local school district information.

FIGURE 2-5 SCHOOL DISTRICTS OF THE COASTAL COMMUNITIES

Table 2-110

Townships and Municipalities in Each School District

School District	Townships/Municipalities
Conneaut Area City	Conneaut City Monroe Township (portion)
Buckeye Local	Kingsville Township North Kingsville Borough Sheffield Township Pierpont Township Ashtabula Township Ashtabula City (portion) Monroe Township (portion) Denmark Township (portion)
Ashtabula Area City	Ashtabula City (portion) Plymouth Township Saybrook Township
Northwestern	Springfield Township East Springfield Borough Cranesville Borough Platea Borough Albion Borough Conneaut Township Elk Creek Township
Girard	Girard Borough Lake City Borough Girard Township
Fairview	Fairview Borough Fairview Township
Millcreek	Millcreek Township

Source: Local school district information.

Table 2-111

Enrollments as Grouped into Grade Levels in Each School District -- 1976-77(1)

	Elementary			Middle/Jr. High			Senior High		
School District	**K-5**	**K-6**	**K-8**	**6-8**	**7-8**	**7-9**	**9-12**	**10-12**	**Total**
Conneaut City	-	1802	-	-	-	835	-	887	3524
Buckeye Local	-	1731	-	-	-	884	-	833	3448
Ashtabula City	-	-	3621	-	-	-	3055	-	6676
Northwestern	-	1450	-	-	-	683	-	682	2815
Girard	923	-	-	503	-	-	653	-	2079
Fairview	900	-	-	570	-	-	761	-	2231
Millcreek	-	4036	-	-	1310	-	2990	-	8336

---

(1) Enrollments include special education and vocational education students.

Source: Local school district information.

least 75 percent of each school district's school-age population. Although nonpublic and vocational school enrollments are of a magnitude relatively minor compared with general public enrollments, each in turn is discussed here because assumptions about future enrollment levels in general public schools necessarily involve corollary assumptions about future nonpublic and vocational school enrollments.

Public Versus Nonpublic Enrollment

2.159
Of all children in school within the seven school districts in 1976, approximately 12 percent were attending nonpublic schools. All of the nonpublic schools are parochial and most of these are Catholic. As shown in Table 2-112, there is considerable variation among the school districts in their respective numbers of nonpublic schoolchildren, ranging from 45 in Northwestern to 2,350 in Millcreek. The nonpublic schools tend to be located in more urbanized areas; hence, the number of children attending nonpublic schools in Millcreek and Ashtabula is much greater than in districts such as Northwestern and Buckeye. Generally, nonpublic school enrollments in the seven districts have captured the same proportion of school-age children over time. In addition, nonpublic schools are experiencing declining enrollments similar to public schools. Based on these trends, it is expected that the distribution of public versus nonpublic school enrollments will remain constant for 1976 to 1990. Projections of public versus nonpublic enrollments were based on baseline population projections previously discussed and on the following assumptions of the percentages of school-age population attending all schools.

	Percent
Elementary ages	5-10 - 96.7
	5-11 - 97.0
	5-13 - 98.6
Middle/Junior High ages	11-13 - 99.0
	12-12 - 99.0
	12-14 - 98.0
Senior High ages	14-17 - 95.0
	15-17 - 95.0

The estimated distribution of present public and nonpublic school enrollments is presented in Table 2-113.

Vocational Enrollments

2.160
Comprehensive vocational education is a fairly recent trend in the Coastal Communities with programs of this type being taught in facilities separate from the regular high schools since the late 1960's.

Table 2-112

Public and Nonpublic Enrollments -- 1976

School District	Public No.	Public %	Nonpublic[(1)] No.	Nonpublic[(1)] %
Conneaut Area City	3,524	94.6	200	5.4
Buckeye Local	3,448	97.9	73	2.1
Ashtabula Area City	6,676	85.1	1,170	14.9
Northwestern	2,815	98.4	45	1.6
Girard	2,079	92.5	168	7.5
Fairview	2,231	97.0	70	3.0
Millcreek	8,336	78.0	2,350	22.0
Total	29,109	87.7	4,076	12.3

---

(1) In the case of Girard, Millcreek and Conneaut, nonpublic school enrollment estimates are adjusted to remove enrolled pupils residing outside the school district in which the nonpublic school is located.

Source: Local school district information and Arthur D. Little, Inc. estimates.

Table 2-113

Percentage of Population Age Group Attending Public Versus Nonpublic Schools -- 1976

School District	Level	Age Group	Percentage Attending All Schools	Percentage Attending Private Schools	Percentage Attending Vocational Schools	Percentage Attending General Public Schools
Conneaut Area City						
	Elementary	5 - 11	97.0%	9.7%	-	87.3%
	Junior High	12 - 14	98.0	4.9	-	93.1
	Senior High	15 - 17	95.0	1.1	11.9	82.0
Buckeye Local						
	Elementary	5 - 11	97.0	1.5	-	95.5
	Junior High	12 - 14	98.0	.5	-	97.5
	Senior High	15 - 17	95.0	.3	9.9	84.8
Ashtabula Area City						
	Elementary	5 - 13	98.6	15.3	-	83.3
	Senior High	14 - 17	95.0	12.7	5.4	76.9
Northwestern						
	Elementary	5 - 11	97.0	2.2	-	94.8
	Junior High	12 - 14	98.0	1.4	-	96.6
	Senior High	15 - 17	95.0	1.4	5.3	88.3
Girard						
	Elementary	5 - 10	96.7	9.0	-	87.7
	Middle	11 - 13	99.0	9.9	-	89.1
	Senior High	14 - 17	95.0	1.0	4.7	89.3
Fairview						
	Elementary	5 - 10	96.7	7.4	-	89.3
	Middle	11 - 13	99.0	.5	-	98.5
	Senior High	14 - 17	95.0	.9	3.8	90.3
Millcreek						
	Elementary	5 - 11	97.0	21.3	-	75.7
	Junior High	12 - 13	99.0	21.8	-	77.2
	Senior High	14 - 17	95.0	17.1	3.9	74.0

Source: Arthur D. Little, Inc. estimates based on local school district information.

These programs are distinguished from the avocational, consumer, or supplementary skill training courses found in the regular high schools by their career orientation and full- or half-time curriculum basis. Comprehensive vocational education programs are generally provided on a county-wide basis in a centralized facility. Eleventh and twelfth grade vocational pupils in Ashtabula County attend the Ashtabula County Joint Vocational School in Jefferson on a full-time basis. With the exception of Erie City, which has its own vocational school, tenth, eleventh, and twelfth grade residents of Erie County are eligible for acceptance to the Erie County Technical School in Summit Township. Enrolled pupils are bused to the school from their home school districts in alternating week sessions such that they spend half of their high school program at the vocational school. In recent years, vocational education enrollments have stabilized as the existing vocational facilities have reached capacity enrollments. The limited facilities of both the Ashtabula County and Erie County vocational schools will preclude any increases in enrollments over 1976 levels until 1981. In 1981, Erie County Technical School expects to expand its capacity to accommodate 800 additional half-time pupils. This will enable each Pennsylvania school district to increase proportionately its present quota of vocational education pupils. In contrast, Ashtabula County Joint Vocational School is not expected to expand. Although school officials believe student demand for expansion presently exists, the vocational school has experienced eight consecutive failures to win voter approval for expansion funding. The vocational school enrollments in the four Pennsylvania districts (as a percentage of the school-age population group) are shown in Table 2-113. It is expected that the number of high-school students from each district attending vocational education schools will remain constant until 1981. (In the three Ohio school districts, the present population is assumed to remain constant through 1990.) For Erie County, the number of vocational school students is expected to increase in 1981 to reflect expansion of that facility; these figures would be exactly double the current enrollments, reflecting the doubling of classroom space. However, the percentages will more than double, reflecting the decrease in the size of the high school age population over the projection period. As the percent of population attending vocational school increases, there will be a commensurate decrease in the relative proportions of general public school enrollments in the Pennsylvania school districts.

Special Education

2.161

Special education pupils constitute a small portion of the total enrollments in the school districts as shown in Table 2-114. Special education in Ashtabula County, Ohio, is handled on a cooperative

Table 2-114

Special Education Pupils -- 1976[1]

School District	No. of Pupils	Percent of Total Enrollments
Conneaut Area City	69	2%
Buckeye Local	72	2
Ashtabula Area City	167	3
Northwestern	92	3
Girard	45	2
Fairview	16	1
Millcreek	162	2

---

(1) Does not include learning disabilities pupils.

Source: Information compiled by the Ohio Department of Education; Financial and Statistical Studies for the School Districts of Northwest Tri-County Intermediate Unit, March, 1977, and Arthur D. Little, Inc., estimates.

basis. School districts, under the auspices of the Ashtabula County Board of Education, share services and facilities for children with speech, hearing, visual and orthopedic impairments. Each of the major school systems in the County offers one of the programs. For example, Ashtabula Area City School Districts accept visually impaired students from throughout the county. The Ohio school districts also provide classes for students with learning disabilities as well as for the educable mentally retarded. State aid is provided to the school districts operating all of these classes. Since 1971, special education has been provided to most of the school districts in Erie County by the Northwest Tri-County Intermediate Unit. (Millcreek School District does not participate in the program.) State special education funds support the I.U.-operated programs on the basis of per pupil tuition. The several programs include those for hearing impaired, learning disabled, trainable mentally retarded, educable mentally retarded, speech impaired, physically handicapped, and homebound pupils. The special education figures shown in Table 2-114 do not include students involved in learning disabilities or in-home tutoring programs as these services are supplied on an itinerant caseload basis which involves students to the extent their needs require. Millcreek School District offers programs for students with special needs; in addition, there are special schools located in the District which provide programs for children with physical and emotional problems. Among these are the Barber School, an independent State approved and regulated school for the mentally retarded, and the Sara Reed School for students with emotional or disciplinary problems. A few students also attend the State School for the Deaf.

Past Trends and Current Enrollments

2.162
The relatively low population growth coupled with low birth rates have resulted in an overall decline in the school-age population since the late 1960's. While some school districts, such as Buckeye, have recorded a fairly stable enrollment over the last 10 years, the two largest school districts, Ashtabula and Millcreek, have experienced enrollment decreases of 10 percent to 12 percent.

2.163
Local Study Area. Historical data on enrollments for both the Conneaut Area City and Northwestern school districts through 1976 is presented in Table 2-115. The enrollment trends are displayed graphically in Figure 2-6. Conneaut Area City School District enrollments grew slightly from 1965 to 1973 at an average rate of 0.5 percent annually. Since 1973, enrollments have declined about 1.5 percent annually. Most of the decline has been due to decreased elementary grade enrollments. In 1976-1977 (1976-1977 school year

Table 2-115

Public School Enrollment Trends in the Local Study Area -- 1965-1976(1)

	Public School	
	Ohio	Pennsylvania
Year(2)	Conneaut Area City	Northwestern
1965	3466	2395
1966	3431	2467
1967	3359	2479
1968	3488	2565
1969	3487	2740
1970	3489	2729
1971	3540	2813
1972	3708	2797
1973	3709	2859
1974	3705	2784
1975	3626	2758
1976	3542	2815

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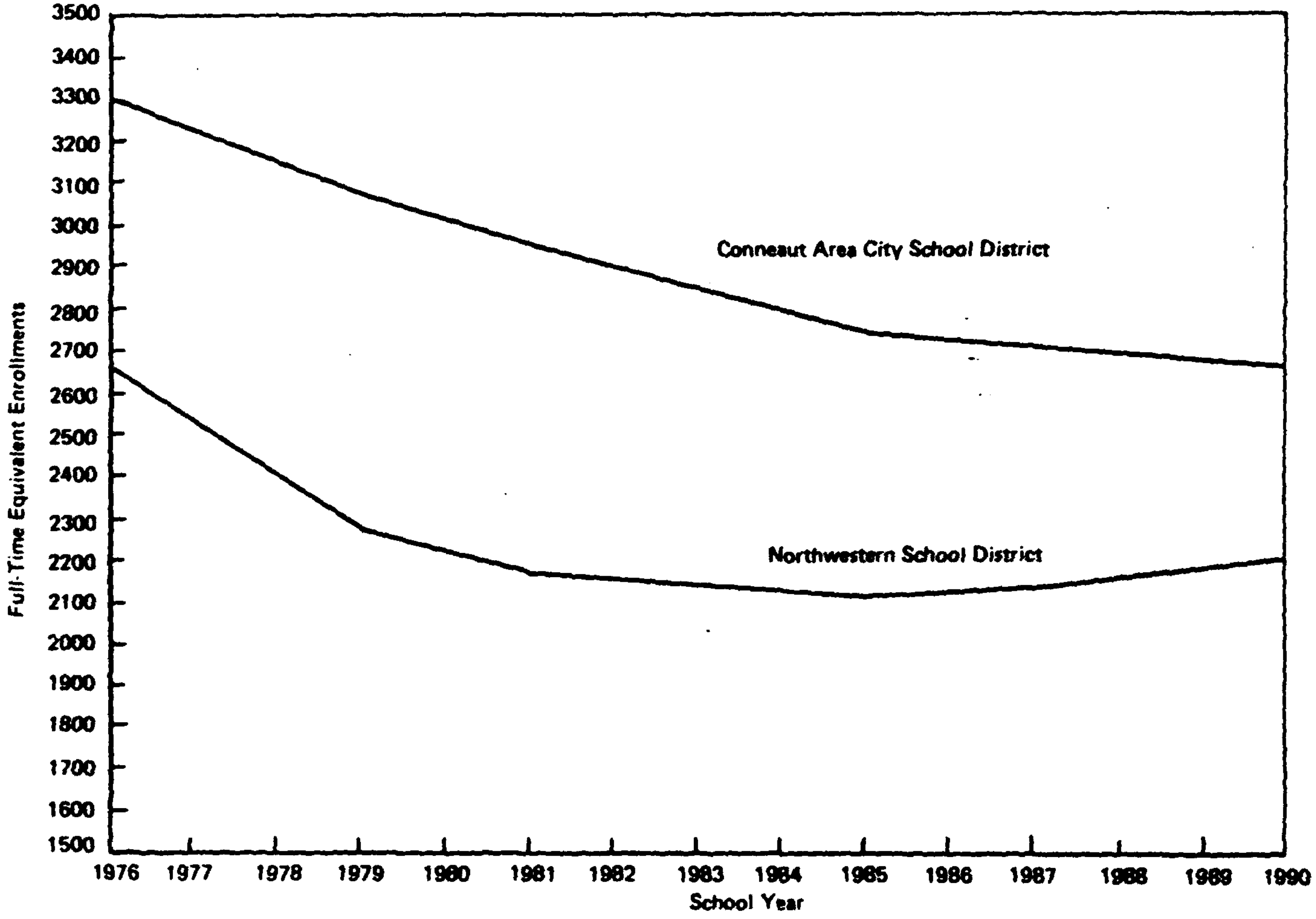
(1) Includes half-day kindergarten pupils, vocational and special education pupils.

(2) School year beginning in fall.

Source: Conneaut Area City Schools, 1975-76 Annual Report; Huston Associates, Master Plan for Housing Conneaut Area City Schools, 1971; Northwestern School District, unpublished information.



Source: Arthur D. Little, Inc. compilation and estimates based on local school district information.

FIGURE 2-6 1976 ENROLLMENTS & PROJECTIONS IN THE LOCAL STUDY AREA – 1979-1990

begins fall 1976 and ends June 1977), Conneaut School District enrollments totaled 3,542. Of the 887 senior high pupils, 120 juniors and seniors attended the Ashtabula County Joint Vocational School on a full-time basis. The Northwestern School District enrollments increased 2.7 percent annually between 1965 and 1971. Since 1971 enrollments have been fluctuating slightly; the annual increase or decrease in total enrollments has varied within a range of 20 to 80 pupils. The clearest trend has been the overall decline of elementary grade enrollments since 1970 which is consistent with the national trend of declining birth rates. In the 1976-1977 school year the Northwestern School District had a total enrollment of 2,815 pupils distributed among the district's five schools. About 80 percent of the pupils attended classes at the three schools comprising the Albion campus with the remainder attending two elementary schools in Springfield Township. In 1976, 72 or approximately 11 percent of the senior high pupils attended the Erie County Technical School on a half-time basis.

2.164
Principal Study Area. Enrollment trends for the Principal Study Area during 1970-1976 are shown in Table 2-116. Although enrollments in the Buckeye and Girard School Districts have held fairly steady or increased, those in Ashtabula City, Fairview, and Millcreek have been declining. A slowdown in housing construction, partly due to natural gas shortages, contributed to Millcreek's enrollment decline, while Ashtabula City has experienced out-migration of young people. Enrollment in Fairview has been declining since 1972. The 1972 enrollment of 2,534 represents a peak for Fairview and compares with the 1976 enrollment of 2,231 which translates into a decline of over three percent per year.

2.165
Projections

Derivation. Public school enrollment estimates for 1979-1990 were based on projections of total population. Estimates of the percentage of total population in each school-age group were applied to the population projections. The resulting estimates were then adjusted by the percentage attending public school by education level (refer to Table 2-113) and converted to full-time equivalent enrollments. Full-time equivalent enrollments count kindergarten and half-time vocational pupils as 0.5, and subtract full-time vocational pupils.

2.166
Findings: Local Study Area. As shown in Table 2-117 and Figure 2-7 public school enrollments in both the Conneaut and Northwestern School Districts are projected to decline through 1985. The overall decline during the 1975-1985 period reflects declining birth rates.

Table 2-116

Public School Enrollment Trends in the Principal Study Area -- 1970-1976(1)

School District	1970	1975	1976	Annual % Change 1970-1976
Buckeye Local(2)	3,349	3,365	3,332	-0.1%
Ashtabula Area City	7,988	6,850	6,676	-2.9
Girard	1,779	2,092	2,127	+3.0
Fairview	2,325	2,369	2,231	-0.7
Millcreek	9,400	8,631	8,336	-2.0

---

(1) Among the school districts with declining enrollments, 1970 was a peak year for Ashtabula City and Millcreek. For Fairview, 1972 was the peak enrollment year with 2534 pupils. Enrollments include vocational education pupils.

(2) Buckeye enrollments uniformly exclude special education pupils.

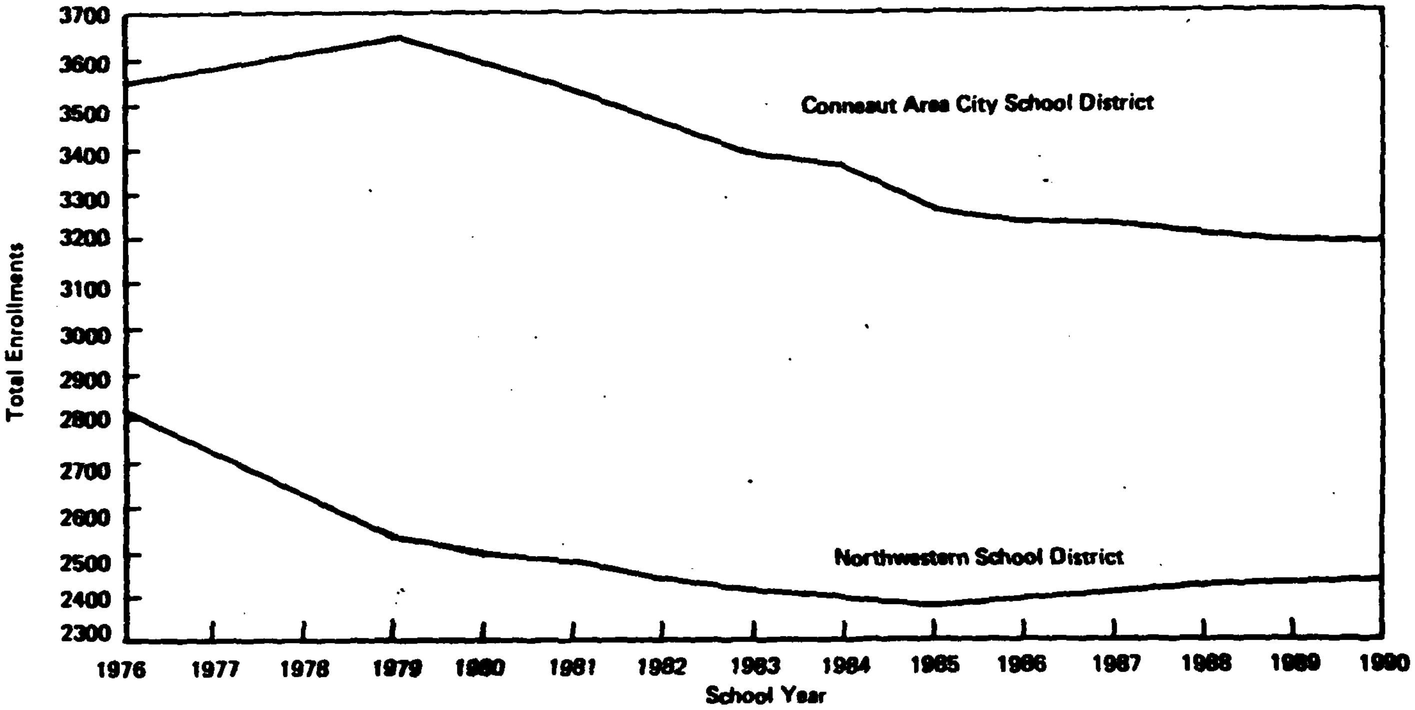
Source: Arthur D. Little, Inc. estimates and local school district information.

Table 2-117

Public School Full-time Equivalent Enrollment Projections in the Local Study Area -- 1979-1990

	Conneaut Area City School District	Northwestern School District
1979	3085	2280
1980	3025	2235
1981	2965	2190
1982	2910	2170
1983	2860	2150
1984	2805	2130
1985	2750	2110
1986	2735	2125
1987	2720	2135
1988	2705	2160
1989	2695	2180
1990	2680	2205

Source: Arthur D. Little, Inc. estimates.



Source: Arthur D. Little, Inc. compilation and estimates based on local school district information.

FIGURE 2–7 1976 ENROLLMENTS AND PROJECTIONS IN THE LOCAL STUDY AREA – 1979–1990

Between 1985 and 1990, however, both the Conneaut City Area and Northwestern School Districts are expected to show relatively stable enrollments. This expectation is based on the children of the "baby boom" population groups reaching school age during this period and offsetting the declining birth rate. Overall, by 1990, the Northwestern School District enrollments are expected to have decreased 17 percent since 1976 or about 1.4 percent annually. A 20 percent decline from 1976-1990 is expected in the Conneaut City Area School District or roughly 1.5 percent per year.

2.167
Findings: Principal Study Area. The projected enrollments from 1979 to 1990 for school districts in the Principal Study Area are presented in Table 2-118. All of the districts show declining enrollments to 1985 with Millcreek, Buckeye, and Ashtabula City declining most rapidly at about two percent annually. Girard and Fairview are expected to be more stable, with a decline of about 0.5 percent to 0.7 percent per year. From 1985 to 1990, Girard, Fairview, and Millcreek show a very slight overall gain, while Buckeye and Ashtabula City total enrollments decline at a reduced rate. This reversal in the Pennsylvania school districts and reduced decline of Ohio school districts are caused mostly by gains in elementary enrollments as the children of the "baby boom" population age group reach elementary ages.

Facilities

Existing Condition and Planned Utilization

Local Study Area

2.168
Conneaut Area City School District. With a few exceptions, school facilities in Conneaut Area City School District are old. Five of the eight schools currently in use were constructed before 1930. As shown in Table 2-119, additions, that have updated and expanded a few of the schools, have been made over the years. Only two schools have been constructed since 1960. In 1975, the voters approved an $850,000 bond issue to expand Rowe Junior High by 24,000 square feet for ancillary facilities including a cafeteria, band room, and library media center. The senior high school has been in need of improvements for several years, but the necessary bond issues have been rejected in three consecutive attempts. In June 1977, a $2.7 million bond issue, which would have authorized construction of nine classrooms and ancillary facilities, was rejected by the voters; 55 percent opposed versus 45 percent in favor. Declining elementary enrollments would enable Conneaut Area City School District to phase

Table 2-118

Public School Full-Time Equivalent Enrollment Projections in the Principal Study Area -- 1979-1990

	Year											
School District	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Buckeye Local	3050	2980	2920	2805	2745	2680	2620	2605	2590	2570	2555	2540
Ashtabula Area City	5770	5655	5530	5410	5290	5165	5045	5010	4980	4945	4915	4885
Girard	1755	1745	1700	1690	1680	1670	1660	1675	1685	1700	1715	1730
Fairview	1880	1860	1845	1830	1825	1815	1805	1820	1840	1855	1870	1885
Millcreek	6950	6815	6555	6450	6345	6240	6130	6155	6180	6205	6225	6250

Source: Arthur D. Little, Inc. estimates.

Table 2-119

Summary of Conneaut Area City School District Facilities

School Name	Grades Served	Date of Original Construction	Dates of Additions	Number of Classrooms(1)	Site Size (Acres)	1976 Enrollment
Amboy Elementary	1-6	1922		6	4.0	172
Chestnut Elementary	K-6	1967		27	18.0	676
Lakeview Elementary	K-6	1928		9	2.2	199
Monroe Elementary	K-6	1938	1952	7	6.75	155
Southeast Elementary	K-6	1960		13	2.4	376
W. Main Elementary	K-6	1923	1967	7	12.5	224
Rowe Junior High	7-9	1916	1935,1937 1953,1967,1975	39	17.5	835
Conneaut High	10-12	1921	1950,1960	30	7.85	887

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(1)Classrooms in each of the schools include all instructional areas.

Source: Master Plan for Housing Conneaut Area City Schools, 1971, Huston Associates; Arthur D. Little, Inc. estimates.

out one of the older and more deficient elementary schools. It is expected that this could occur by 1987. As shown in Table 2-119, the typical Conneaut school site is small, and prohibits future expansion. Only the Chestnut Elementary site is currently adequate and could accommodate moderate expansion. A 1971 Master Plan for Housing Conneaut Area City Schools (2-10) advocated the expansion of all sites where feasible, with the exception of Chestnut Elementary. For example, the high school site of 7.85 acres is far below the 39 acres recommended for a school of its enrollment size. The high school is located in a thickly settled residential section, with homes abutting the school property. As a result, recreational space is confined to a very small area. Rowe Junior High, with current enrollment of 835, should have a minimum site of 28-29 acres. (2-10) There is some area for expansion in the present 17.5-acre site but at the expense of needed recreational area. Owing to overall declining junior high enrollments, however, it is not expected that the Rowe Junior High School will require expansion.

2.169
Northwestern School District. There are five schools in the Northwestern School District. Three facilities have been built since 1954 and together they share a 77-acre site in Albion. The other two schools are older and relatively small elementary schools and are located in Springfield Township. The predominantly centralized location of the schools and the large geographic area comprising the district require considerable busing of pupils, thus resulting in high transportation expenditures. A summary of the size and age of the Northwestern School District facilities, including the dates of original construction and additions, site acreages, and numbers of classrooms is presented in Table 2-120. With the exception of the West Springfield Elementary School, the Pennsylvania Department of Education rated the facilities as satisfactory. West Springfield, occupying four acres, was considered unsatisfactory due to inadequate site size. The 12.5-acre site of East Springfield is adequate for the size of school it presently serves (grades K-3) although no space is available for future expansion. According to school officials, the long-range plans for the two Springfield elementary schools potentially include renovating the older portions of East Springfield and phasing out West Springfield. With the declining enrollments, the Northwestern School District officials expect this plan will adequately accommodate future enrollment. No additions or expansions are expected based on future projections. The Albion complex, including the junior and senior high schools and the Northwestern Elementary School, is relatively new, in good condition, and spacious. In 1973, the senior high school was constructed at a cost of over $2.7 million. Although the newest facility, it is also the most likely to need expansion should enrollments increase. School officials noted that the infrastructure for expanding the high school

Table 2-120

Summary of Northwestern School District Facilities

School Name	Grades Served	Date of Original Construction	Dates of Additions	Number of Classrooms(1)	Site Size (Acres)	1976 Enrollment
East Springfield Elementary	K-3	1926	1960,71	15	12.5	333
West Springfield Elementary	4-6	1912	1939	10	4.0	248
Northwestern Elementary	K-6	1968	1970	36	77.0(2)	869
Northwestern Junior High	7-9	1954	1958	43	77.0(2)	683
Northwestern Senior High	10-12	1973	-	31	77.0(2)	682

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(1) Classrooms in elementary schools include the kindergarten rooms and special education rooms in addition to regular instructional rooms. In the junior and senior high schools, all instructional areas are included.

(2) The 77-acre campus in Albion is shared by the Northwestern Elementary, Junior High, and Senior High.

Source: Northwestern School District information.

facility is already in place; thus, the construction of additional classrooms would be relatively inexpensive. However, with declining enrollments, expansion is not expected to be necessary.

2.170

Principal Study Area. Existing school facilities in the Principal Study Area are summarized in Table 2-121. There is considerable variation in the quality of facilities among the school districts. Ohio school districts generally have a more difficult task achieving facility improvements as voter approval of bond issues is required; hence, Ohio facilities tend to be older than Pennsylvania facilities. Pennsylvania school districts have the authority to acquire capital funds through lease-rental agreements with the Pennsylvania School Building Authority or, a local authority. The Buckeye School District facilities are in fair to good condition. All of Buckeye's seven schools have undergone some renovation or expansion since 1950. However, four of the five elementary schools and the junior high occupy inadequate sites and have limited expansion potential. Braden Junior High has the greatest need for improvements (e.g., cafeteria, library). A $3.7 million bond issue, which failed in the June 1977 balloting (67 percent opposed), would have improved three elementary schools, the junior high, and expanded the senior high to accommodate ninth grade pupils. The Ashtabula Area City School District facilities are generally older than other schools in the Principal Study Area. One elementary school, for example, was originally constructed in 1880 and Ashtabula High School was built in 1915. Bond issues to replace the older facilities have not been successful, although an improvement levy was approved by the voters in 1975. The three-mill levy over five years will provide $2.5 million toward repair and renovation of the schools. With declining enrollments, plans for expansion are not necessary. The Pennsylvania Principal Study Area school districts have relatively new schools which are well maintained and adequately sited. Two of the Girard School District's three schools have been built since 1964: Elk Valley Elementary in 1964 and Girard High School in 1974. The Rice Avenue Middle School, which shares a 65-acre site with the high school, was renovated in 1955. There are presently no plans for major expansion of the Girard facilities, although some remodeling is expected to occur at the Rice Avenue Middle School. The Fairview School District's facilities are in excellent condition and generally sited on spacious grounds. Fairview High School, opened in 1973, is a modern and generally excellent facility and is sited on 45.5 acres. Garwood Middle School, built in 1961 on a 43-acre site, was expanded in 1967. The two elementary schools have had major renovations and additions in the last 10 years and each has an adequate site. Due to declining enrollments, the Chestnut Elementary School in 1977 is contracting to serve grades 2-5 while Manchester Elementary School will accomodate grades K-1. Only half of the Manchester classrooms are currently

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Table 2-121

Summary of Public School Facilities in the Principal Study Area

School District	Number of Schools	Average Site Size (Acres)	Age of Original Structure	Most Recent Additions	No. of Classrooms	1976 Enrollment
Buckeye Local						
- Elementary	5	6.7	1937 (median)	1961	67	1731
- Junior High	1	22.1	1928	1958	41	884
- Senior High	1	49.1	1961	-	34	833
- Total					142	3448
Ashtabula Area City						
- Elementary	12	N/A	N/A	N/A	174	3621
- Senior High	2	N/A	1915 & N/A	N/A	143	3055
- Total					317	6676
Girard						
- Elementary	1	50.0	1964	-	34	923
- Middle	1	65.0(1)	1928	1955	24	503
- Senior High	1	65.0(1)	1974	-	46	653
- Total					104	2079
Fairview						
- Elementary	2	11.4 & 39	1928 & 1959	-	51	900
- Middle	1	43.0	1961	-	34	570
- Senior High	1	45.5	1973	-	N/A	761
- Total					-	2231

Table 2-121 (Continued)

School District	Number of Schools	Average Site Size (Acres)	Age of Original Structure	Most Recent Additions	No. of Classrooms	1976 Enrollment
Millcreek						
- Elementary	10	N/A	1950 (median)	1971	176	4036
- Junior High	2	N/A	1958 & 1967	1970	65	1310
- Senior High	2	N/A	1971 & N/A	-	140	2990
- Total					381	8336

---

(1)Girard's middle and senior high schools share a 65-acre site.

N/A = Not Available.

Source: Local school district information.

used. Although future expansion is not expected to be required, the 1967 addition at Manchester was designed to allow rapid and inexpensive future expansion. The Millcreek School District's facilities are generally older than those found in the Girard and Fairview School Districts, but have been well maintained through renovation and expansion. Four new schools have been built in the last 12 years, including two elementary schools, a junior high, and the intermediate high school. Due to declining enrollments, no plans for expansion are necessary. The Millcreek School District has recently studied the alternatives for contracting utilization of school facilities.

Construction Procedures

2.171
In Pennsylvania, construction of new public or vocational schools follows specific procedures under the auspices of the Pennsylvania Department of Education. According to staff of the Pennsylvania Department of Education, the approval process, which requires about one year or less, commences with the local school district certifying that the project has been initiated and designating a district liaison to coordinate the project approval process. The school district must have an updated long-range plan which can serve as the basis for justifying the need for the project. Included in the approval application are an evaluation of the project's conformance to the long-range plan, its relative advantages over other options and a plan for utilizing existing facilities at capacity levels acceptable to the school district. Projected enrollments must also be provided if after State review of the justification data and inspection of the district's facilities, the project is determined to be justifiable, it is assigned a "justified enrollment," which is the capacity to which the district can build. If State review of the project results in disagreement with the local district regarding the need for the project, negotiations commence toward the aim of determining an alternative facilities plan. During the approval process, the district may present preliminary architectural plans for the allocation of space and the most feasible utilization of facilities. Later in the approval process, the State reviews final architectural plans for conformance to State-recommended space allocation standards which allow considerable flexibility. The final step of the approval process involves obtaining construction bids on which the State bases its commitment to sharing the construction costs of the project. Vocational school construction projects in Pennsylvania follow a procedure similar to that applied to general public schools. Initial review of program plans and space allocation is the responsibility of the Vocational Technical School Division of the Department of Education with the remaining procedures, as for general public schools, administered by the Division of Educational Management

Services. For either vocational or general public schools, actual construction of the project would normally require about one year. In Ohio, construction projects must meet only two requirements. First, a bond issue to finance the project must be approved by a majority of the voters in the school district. Second, the final construction drawings are reviewed by the State for compliance with State building codes and standards for safety, health, and adequate accommodation for the handicapped. Since no State funds are available for school construction projects, the State's involvement is limited.

Capacity

2.172
This section discusses the capacity of school facilities within each school district. Capacity has been defined as the maximum number of pupils which can be accommodated at each educational level. Estimates of the capacities of the facilities were compared with the projected public school enrollment to determine, if crowded, the extent of additional facilities likely to be required or, if under-capacity, the extent of available pupil space. Generally, the Conneaut City area, Buckeye and Girard School Districts are the only areas where capacity has been reached or exceeded in one or more educational levels. Conneaut High School was overcrowded in 1976 and is expected to remain over-capacity, although at reduced levels, through the late 1980's. The school is also deficient in auxiliary facilities and outdoor recreational area. Despite these problems, the Conneaut High School bond issue has failed repeatedly over the last few years. Buckeye and Girard District schools were not considered crowded in 1976 although enrollments were slightly over or at capacity in a few schools. Overall declining enrollments will create excess capacity. The remaining school districts show no crowding conditions and they should have considerable excess capacity through 1990.

Estimates

2.173
Capacity estimates by educational level have been made for each of the seven school districts. These estimates are based on the following assumptions:

> For each education level (elementary, middle or junior high school, and senior high school) capacity estimates are based on a standard of 25 pupils per teaching station or classroom. As junior and senior high classrooms are not normally occupied 100 percent of the school day, capacity estimates assume 85 percent utilization for secondary grades.

Pupils are enumerated as full-time equivalents. Kindergarten pupils are considered half-day pupils as are Pennsylvania vocational education pupils. Ohio pupils who attend vocational schools full time are excluded.

Expansions of existing facilities are not anticipated in any of the school districts, although Conneaut Area City and Buckeye School Districts placed bond issues on the ballot in June 1977 for moderate expansion and improvements in secondary grades. Both issues failed. Capacity in present facilities is expected to be adequate over the next 10-15 years, primarily due to the present lack of overcrowding and the anticipated decline in overall enrollments throughout most of the forecast period.

Moreover, the failures of all recent school bond issues in the Ohio Principal Study Area and the additional decline in enrollments of Pennsylvania senior high schools owing to the expected expansion of the Erie County Technical School, make capacity additions unlikely under baseline conditions.

Two aged and substandard elementary schools could be phased out of use by 1987. Both are in the Local Study Area; phasing out one such school in the Conneaut Area City School District would reduce elementary capacity by 200 seats. The phase-out of West Springfield Elementary in the Northwestern School District would reduce capacity by 250 seats.

The capacity estimates for the years 1976 to 1990 are presented in Table 2-122. Figures 2-8 and 2-9 display the trends of projected enrollments and capacity in the Local Study Area.

Findings

2.174

Local Study Area. The Conneaut Area City School District was close to capacity in elementary grades in 1976 but appears capable of handling 270 additional pupils by 1979. Excess capacity is estimated to increase through 1985 and then drop in 1987 owing to the assumed phase-out of a 200-pupil elementary school. Even with this seating reduction, 120 seats would be available in 1990. Enrollment at Rowe Junior High exceeded capacity by only 10 pupils in 1976 and is expected to slightly exceed capacity until 1984-1985. The enrollment excess is not of a magnitude to constitute crowding. Conneaut Senior High is already overcrowded, with enrollment exceeding capacity by 123 in 1976. Enrollments are expected to increase through 1979 when capacity will be exceeded by 160. Since enrollments are expected to

Table 2-122

Public School Capacity Estimates -- 1976-1990[1]

School District	No. of Classrooms	Capacity[2]	1976 Enrollment	1976 Excess Capacity	1979 Enrollment	1979 Excess Capacity	1985 Enrollment	1985 Excess Capacity	1990 Enrollment	1990 Excess Capacity
LOCAL STUDY AREA										
Conneaut										
Elementary (K-6)	69	1725	1704	21	1455	270	1295	430	1405	120[3]
Jr. High (7-9)	39	825	835	-10	830	-5	760	65	670	155
Sr. High (10-12)	30	640	763	-123	800	-160	695	-55	605	35
Total	138	3190	3302	-112	3085	105	2750	440	2680	310
Northwestern										
Elementary (K-6)	61	1525	1344	181	1115	410	1045	480	1195	80[3]
Jr. High (7-9)	43	915	683	232	575	340	555	360	520	395
Sr. High (10-12)	31	660	646	14	590	70	510	150	465	195
Total	135	3100	2673	427	2280	820	2110	990	2180	670
PRINCIPAL STUDY AREA										
Buckeye										
Elementary (K-6)	67	1675	1677	-2	1495	180	1305	370	1400	275
Jr. High (7-9)	41	870	884	-14	800	70	660	210	580	290
Sr. High (10-12)	34	725	739	-14	755	-30	655	70	560	165
Total	142	3270	3300	-30	3050	220	2620	650	2540	730
Ashtabula										
Elementary (K-8)	174	4350	3421	929	3160	1190	2755	1595	2830	1520
Sr. High (9-12)	143	3040	2855	185	2610	430	2290	750	2055	985
Total	317	7390	6276	1114	5770	1620	5045	2345	4885	2505
Girard										
Elementary (K-5)	34	850	845	5	675	175	660	190	765	85
Middle (6-8)	24	510	503	7	430	80	410	100	425	85
Sr. High (9-12)	46	980	618	362	650	330	590	390	540	440
Total	104	2340	1966	374	1755	585	1660	680	1730	610
Fairview										
Elementary (K-5)	51	1275	835	440	725	550	715	560	830	445
Middle (6-8)	34	720	570	150	495	225	470	250	485	235
Sr. High (9-12)[2]	N/A	855	731	124	660	195	620	235	570	285
Total		2850	2136	714	1880	970	1805	1045	1885	965
Millcreek										
Elementary (K-6)	176	4400	3732	668	3310	1090	3010	1390	3400	1000
Jr. High (7-8)	65	1380	1310	70	1110	270	1030	350	985	395
Sr. High (9-12)	140	2975	2860	115	2530	445	2090	885	1865	1110
Total	381	8755	7902	853	6950	1805	6130	2625	6250	2505

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[1] All enrollments are given as full-time equivalent pupils.

[2] Capacity estimates are based on 25 pupils per classroom or teaching station, with the exception of Fairview. Fairview Senior High estimates are derived from the State "rated capacity" of 1100 which is 1.105 times "practical capacity." For all senior and junior highs, a utilization factor of 0.85 has been applied.

[3] Assumes the closing of a 200-seat elementary school in Conneaut and a 250-seat elementary school in Springfield.

N/A = Not Available.

Source: Arthur D. Little, Inc. estimates and local school district information.

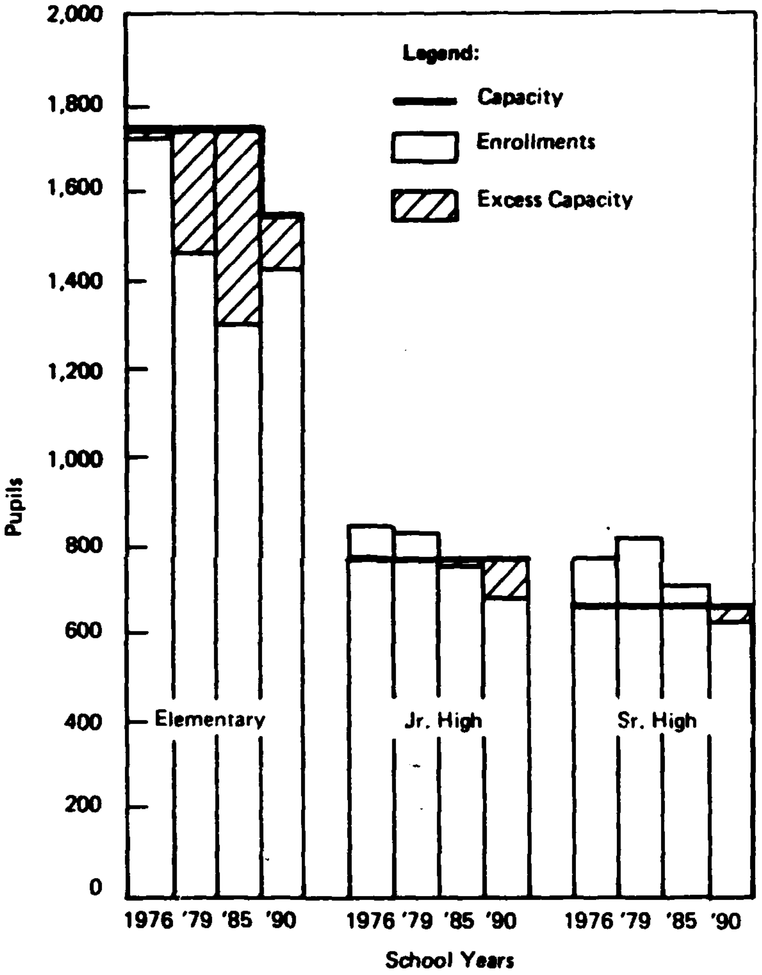

FIGURE 2–8 CONNEAUT AREA CITY SCHOOL DISTRICT: CAPACITY ESTIMATES – 1976–1990

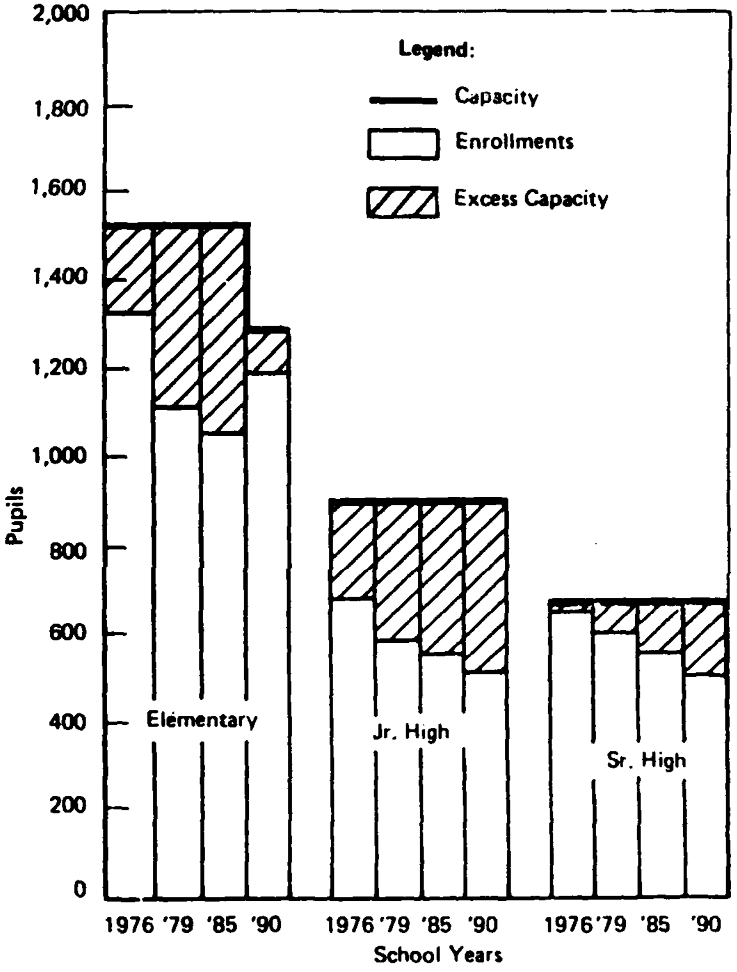

FIGURE 2–9 NORTHWESTERN SCHOOL DISTRICT: CAPACITY ESTIMATES – 1976–1990

decline through 1990, the crowded conditions will ease and should disappear by 1988-1989. In addition to an overcrowding problem, the Conneaut High School facility is presently inadequate in several other areas, such as ancillary and recreational facilities. The Northwestern School District has excess capacity in most of its educational levels. Although the senior high enrollments in 1976 were at 98 percent capacity, excess capacity should gradually increase as enrollments decline through 1990. Due to declining elementary enrollments, the phase-out of West Springfield Elementary by 1987 would not cause crowding. Even with the resulting reduction in capacity by 250 seats, Northwestern would have about 80 available seats in 1990.

2.175

Principal Study Area. As rated in Table 2-122, with two exceptions, the school districts in the Principal Study Area had substantial excess capacity in 1976 and are expected to so continue through 1990. The Fairview, Millcreek, and Ashtabula Area City School Districts are estimated to show 1979 enrollments equal to 66 percent, 80 percent, and 78 percent of capacity, respectively. Fairview and Millcreek have plans to contract facilities as enrollments continue to decline. Ashtabula City, with its older schools, may phase out its more inefficient facilities, but has not announced plans to do so. The Girard School District elementary and middle school enrollments in 1976 were at capacity, while the high school showed a 63 percent utilization. The elementary grades are expected to have space for 175 additional pupils by 1979, reaching 190 by 1985. As a result of a change in enrollment trends after 1985, excess capacity in the elementary grades will decline, falling to 85 spaces by 1990. Similar trends in excess capacity are expected in the middle school during the 1979-1990 period. In 1976, Buckeye Local School District enrollments at all educational levels slightly exceeded capacity. Based on enrollment projections, the high school is expected to reach a maximum of 30 pupils over capacity in 1979, but by 1990 it will have 165 available pupil openings. By 1979, the elementary and junior high schools should show excess capacity of 180 and 70 pupils, respectively, and continue to increase excess capacity to 1990.

Staff

2.176

Three types of pupil-to-staff ratios have been estimated to define staff requirements, these are: number of pupils per instructional staff (instructional staff is defined as full-time equivalent teachers, including special resource teachers); number of pupils per support staff (support staff includes bus drivers, nurses, paraprofessionals, librarians, clerical, cafeteria, maintenance, and custodial staff); and, number of pupils per administrative staff

(administrative staff includes superintendents, principals, supervisors, and guidance counselors). For each ratio, the standards were derived judgmentally from local school district information and national trends. The standards are compared with actual data from selected school districts in the Principal Study Area and State and national figures and are summarized in Table 2-123. Pupils-to-instructional staff ratios vary by educational level such that standards have been estimated for elementary, junior high or middle, and senior high school. As shown in Table 2-124, these standards are close to and sometimes lower than the actual data. This is justified by the expectation that by 1979, consistent with national trends, pupils-to-instructional staff ratios will decline. To project staff requirements to 1990, the above standards have been applied to projected enrollments discussed earlier. The resulting estimates are presented in Table 2-125. Overall, staff levels should be shifting very slightly during the years 1979-1990, generally following enrollment trends. For example, the Northwestern School District's total staff of 174 in 1979 compares with 169 in 1990. Similarly, the Conneaut Area City School District is expected to employ approximately 240 school staff by 1979 and 205 in 1990. The decrease of 15 percent in Conneaut School District staff parallels the 13 percent enrollment decrease for the same period.

Operating Costs

2.177
All of the school districts' 1975 operating costs per pupil are close to or below their respective State averages (refer to Table 2-126). Although urbanized, the Conneaut Area City and Ashtabula Area City School Districts spend close to the amount expended per pupil in districts which are less densely populated. Except for the Fairview School District, the study area school districts in Pennsylvania are all well below the U. S. average operating costs per pupil. Fairview is close to the overall State average and exceeds that for the United States. This results partly from the higher tax base in the Fairview School District. Overall tax levels do remain a constraint on expenditures in Pennsylvania School Districts but less so than in Ohio since tax levy increases for operating expenditures do not require voter approval in Pennsylvania.

Estimates

2.178
The estimates of 1975 operating costs per pupil which have been determined for each school district and the estimates of per-pupil operating costs for the years 1979-1990 which are assumed standards applied uniformly to the projected full-time enrollments in elementary, middle or junior high, and senior high schools are presented in Table 2-127. A uniform application is necessary because school

Table 2-123

Pupils-Per-Staff Ratio as Average of All Educational Levels

School District or other Data Region	Data Year	Pupils Per Instructional Staff	Pupils Per Support Staff	Pupils Per Administrative Staff
United States	1975	20.4	N/A	N/A
Ohio	1975	21.7	N/A	N/A
Pennsylvania	1975	19.3	N/A	N/A
Conneaut Area City	1975	22.0	40.5	178
Northwestern	1976	23.6	35.7	222
Buckeye Local	1974	20.7	39.1	223
Assumed Standard(1)	1979	21	39	200

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(1) Developed by the Applicant's consultant, Arthur D. Little, Inc.

N/A = Not Available.

Source: "Statistics of Public Elementary and Secondary Day Schools, Fall, 1975," National Center for Education Statistics, Washington, D.C.; U.S. Government Printing Office, 1976; local school district information; and Arthur D. Little, Inc. estimates.

Table 2-124

Pupils-Per-Instructional Staff Ratio

School District	Data Year	District Average	Elementary	Jr. High/ Middle	Senior High
Conneaut Area City	1975	22.0	23.8	20.8	21.4
Northwestern	1976	23.6	24.9	22.0	19.6
Buckeye Local	1974	20.7	21.3	22.3	18.6
Assumed Standard(1)	1979		23.0	21.0	20.0

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(1) Developed by the Applicant's consultant, Arthur D. Little, Inc.

Source: Arthur D. Little, Inc. estimates based on school district reports.

Table 2-125

Staff Requirements by School District and Educational Level -- 1979-1990(1)

School District	1979 Instructional	1979 Support	1979 Administrative	1985 Instructional	1985 Support	1985 Administrative	1990 Instructional	1990 Support	1990 Administrative
LOCAL STUDY AREA									
Conneaut									
Elementary	63			56			61		
Junior High	40			36			32		
Senior High	40			35			30		
TOTAL	143	81	16	127	70	15	123	69	13
Northwestern									
Elementary	48			46			52		
Junior High	27			27			26		
Senior High	30			2[illegible]			23		
TOTAL	105	58	11	98	54	11	101	57	11
PRINCIPAL STUDY AREA									
Buckeye									
Elementary	65			57			61		
Junior High	38			31			27		
Senior High	38			33			28		
TOTAL	141	78	15	121	67	13	116	65	13
Ashtabula									
Elementary	137			120			123		
Senior High	131			115			103		
TOTAL	268	148	29	235	129	26	226	126	25
Girard									
Elementary	30			29			34		
Middle	21			20			20		
Senior High	33			30			27		
TOTAL	84	45	9	79	43	8	81	44	8
Fairview									
Elementary	32			32			37		
Middle	23			22			23		
Senior High	33			31			28		
TOTAL	88	48	9	85	46	9	88	48	9
Millcreek									
Elementary	144			131			148		
Middle	53			49			47		
Senior High	111			105			93		
TOTAL	308	170	33	285	157	31	288	160	31

---

(1) For support and administrative staff, only total for district is given.

Source: Arthur D. Little, Inc. estimates based on local school district information.

Table 2-126

Operating Costs Per Pupil -- 1975

School District	Operating Cost Per Pupil[1]
U.S. Average	$1312
Ohio - City District Average	1223
Local District Average	1045
Pennsylvania Average	1392
Conneaut Area City	1100
Buckeye Local	1118
Ashtabula Area City	1060
Northwestern	1194
Girard	1197
Fairview	1345
Millcreek	1273

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(1) For local school districts, operating costs exclude debt service and vocational education, but include an average capital outlay of $10.00 per pupil to cover recurring equipment costs. For U.S., Pennsylvania and Ohio averages, the capital outlay of $10.00 per pupil is also included; these figures are based on average daily membership, whereas per-pupil costs of the local school districts are based on full-time equivalent enrollments.

Source: Arthur D. Little, Inc. estimates derived from local school district information; Costs Per Pupil, School Year 1975-76, Ohio Department of Education; unpublished data from the Pennsylvania Department of Education and the National Center for Education Statistics.

Table 2-127

Operating Costs Per Pupil -- 1975-1990(1)

School District	1975(2)	Assumed Standard(3) 1979-1990
Local Study Area		
Conneaut Area City	$1100	$1250
Northwestern	1194	1250
Principal Study Area		
Buckeye Local	1118	1250
Ashtabula Area City	1060	1250
Girard	1197	1250
Fairview	1345	1350
Millcreek	1273	1275

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(1) In 1975 constant dollars; excludes cost of debt service.

(2) Based on 1975 full-time equivalent enrollments.

(3) Developed by the applicant's consultant, Arthur D. Little, Inc.

Source: Arthur D. Little, Inc. estimates based on local school district information.

district operating costs are not compiled on the basis of grade level. Although senior high students require more equipment, the effect on per pupil operating costs is minimal. This assumption is based on the consideration that 64 percent to 70 percent of operating budgets are allocated to salaries with seven percent to nine percent to benefits and about 17 percent to materials and equipment. With pupils per instructional staff ratios fairly close (elementary = 23/1, junior high = 21/1, senior high = 20/1), the working assumption of equivalent operating costs among grade level groupings seem reasonable. Operating costs include general fund expenditures for administration, instruction, operation and maintenance of plant, fixed charges, health and community services, student activities, special education, and in Ohio, other fund categories supported by Federal revenues. Pennsylvania general fund budgets include all expenditures except the school lunchroom and milk fund. Excluded from operating costs are the following: interest on debt and principal payments; tuition and rentals paid by each Pennsylvania school district to the Erie County Technical School;* school lunchroom and milk fund; and, capital outlay on permanent improvement fund items in excess of the "recurring" equipment allotment of $10 per pupil. For the years 1979-1990, an assumed standard of $1,250 per pupil, in 1975 constant dollars, is applied to five of the seven school districts' projected fulltime equivalent enrollments. The two exceptions are Fairview and Millcreek School Districts with assumed standards of $1,350 and $1,275 per pupil, respectively. These per-pupil operating cost estimates are based on the following assumptions:

> The 1975 operating cost per pupil is assumed to be the "base" cost, or the actual cost per full-time equivalent pupil; these data are presented in Table 2-127.
>
> The $1,250 per pupil standard is derived on the basis of the average expected ratios of pupils to instructional, administrative, and support staff and the assumption that wages, averaging $10,500 per staff annually in 1975 constant dollars, would constitute 65 percent of operating expenditures. Each pupil would require 0.0772 staff which is $811 in staff wages. Assuming that wages are 65 percent of operating expenditures, the estimated operating cost per pupil is $1,250.

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* Ohio School districts do not pay tuition and rentals to the Ashtabula County Joint Vocational School. Rather, Ashtabula County levies a county-wide tax to support operating costs and capital programs.

> The per-pupil operating cost standards used for budget projections for Millcreek and Fairview School Districts are based on estimates of their respective 1975 operating costs per pupil of $1,275 and $1,350. These 1975 estimates are higher than the $1,250 per pupil standard applied to the other five school districts. It is assumed that, although higher than would be required by the estimates of per-pupil staff expenditures of $1,350 and $1,275 per pupil reflect Fairview's and Millcreek's preferred allocations.

Shown in Table 2-128 are the 1975 to 1990 total operating expenditures, in 1975 constant dollars, as projected on the basis of full-time equivalent enrollments. The projected trend of operating expenditures follows that of enrollments. From 1975 to 1980, total operating expenditures, except for Fairview and Millcreek, change slightly upward or downward, depending on the extent to which decreasing enrollments would offset the assumed increases in costs per pupil. For example, although Ashtabula enrollments are expected to decrease by over 700 pupils between 1975 and 1980, the $1,250 per-pupil standard in 1980, compared with the $1,060 estimate in 1975, would cause a slight increase in the budget. Since Fairview and Millcreek School Districts' operating cost estimates do not change between 1975 and 1980, their total operating expenditures sharply decrease as their respective enrollments decline (Fairview enrollment decreases from 2260 in 1975 to 1880 in 1980; Millcreek enrollment decreases from 8035 in 1975 to 6815 in 1980). After 1985, the projected total operating expenditures follow the expected enrollment trends which consist of a reduced rate of decline in the Ohio Districts, and a slight increase in the Pennsylvania school districts. Over the 15-year period, the school districts are expected to experience a 15 percent decrease in operating expenditures, in terms of 1975 dollars (from $33 million in 1975 to $28 million in 1990).

Capital Costs

2.179

Capital costs include expenditures for new construction and permanent improvements or capital outlay for non-recurring items. The costs of new construction are financed by bonds which are repaid over time in annual installments, or debt service, on the principal and interest. Capital outlay or permanent improvements is a budget category that varies considerably in its composition. Generally, capital outlay may include expenditures for acquiring land, buildings and equipment, and for improving sites and buildings. However, expenditures considered capital outlay by definition may appear in other budget categories. Although "capital outlay" is a general fund budget item in Ohio and Pennsylvania school districts, capital outlay items, such as

Table 2-128

School District Total Operating Costs -- 1975-1990(1)

School District	1975	1980	1985	1990
Local Study Area				
Conneaut Area City	$ 3,620	$3,780	$3,435	$3,350
Northwestern	3,145	2,805	2,640	2,755
Principal Study Area				
Buckeye Local	3,790	3,725	3,280	3,175
Ashtabula Area City	6,770	7,070	6,305	6,105
Girard	2,376	2,185	2,075	2,165
Fairview	3,041	2,540	2,435	2,545
Millcreek	10,229	8,690	7,820	7,970

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(1) In thousands of 1975 constant dollars, based on projected full-time equivalent enrollments, and excluding capital costs.

Source: Arthur D. Little, Inc. estimates based on local school district information.

school buses, may appear elsewhere. In Ohio, costs for improvements to old buildings are shown under a separate permanent improvement fund. Expenditures for permanent improvements or capital outlay, especially for large renovation projects, may be financed by bonds and repaid over time or they may be a one-time expense in a particular year, such as landscaping a site. For the purpose of this discussion, permanent improvements are considered in the capital cost category of "capital outlay for nonrecurring expenses" or net capital outlay. Excluded from these capital cost estimates is "capital outlay for recurring equipment costs" which are included within the estimated operating costs per pupil (see the preceding section on operating costs). Thus, capital outlay for nonrecurring expenditures, or net capital outlay, as estimated in this section, are the amounts over and above the estimated capital outlay expenditure of $10 per pupil included in operating costs.

Past and Current Expenditures: Debt Service

2.180
The school districts in Ohio have little outstanding debt for school construction relative to the school districts in Pennsylvania. As shown in Table 2-129, the Ashtabula and Buckeye Districts have existing debt repayment schedules that are reported to leave them debt-free in 1979 and 1981, respectively. The Conneaut District's existing debt comprises largely the Rowe Junior High School addition in 1975. As presently scheduled, the Conneaut annual debt service declines from $217,500 in 1975 to $140,000 by 1979 due to the settlement of $55,000 in issues. The annual reduction in Conneaut City Area School District's debt service payment due to declining interest was estimated. In contrast, the existing debt schedules of the Pennsylvania school districts generally show high debt service payments through 1990. The difference between the two States is attributable to the differences in State and local funding of new schools. Ohio provides no funds to local school districts for construction. Furthermore, a school district in Ohio cannot incur capital debt via a bond issue without voter approval. As mentioned earlier, Pennsylvania school districts do not need voter approval to incur capital debt and may enter into a lease-rental financing agreement with the Pennsylvania School Building Authority or a locally established authority, either of which may issue a bond on behalf of the school district. Pennsylvania School Districts also receive approximately 50 percent State aid for building schools with the actual percentage depending on the school district's State aid ratio. For example, the Northwestern District shows annual debt service payments of $658,000 of which approximately $390,000 is subsidized by the State. All of the Pennsylvania School Districts have undertaken major capital programs since 1965; hence, all have high

Table 2-129

Debt Service Schedules Toward Repayment of Outstanding Indebtedness -- 1975-1990

(1975 Dollars)

	Total Debt Outstanding(1)	Annual Payments 1975	1980	1985	1990
Conneaut Area City	$ 1,447,000	$ 217,500	$ 140,000	$ 118,000	$ 63,000
Buckeye Local	574,000	185,772	144,000	-0-	-0-
Ashtabula Area City	626,000	35,941	-0-	-0-	-0-
Northwestern	7,546,300	658,316	658,316	658,316	658,316
Girard	6,661,400	547,000	547,000	547,000	547,000
Fairview	9,080,600	837,792	825,350	753,033	693,033
Millcreek	18,764,500	2,191,214	2,267,714	1,842,350	157,000

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(1) Includes principal and interest on bonds and notes as of December 31, 1976.

Source: Local school district information including annual audit and financial reports.

levels of outstanding indebtedness. Most of the Northwestern District's total debt constitutes new construction or additions undertaken since 1969, including the new high school in 1973, the new elementary school and its addition in 1969-1971, and additions to East Springfield Elementary School in 1970-1971. The Girard District constructed a new high school in 1974 and a new elementary school in 1964. The Fairview District undertook elementary school expansions in 1967 and 1972 and built a new high school in 1973. The Millcreek District has constructed four new schools in the past 12 years, including two elementary schools, a junior high, and the intermediate high school.

Past and Current Expenditures: Capital Outlay

2.181
Capital outlay expenditures have varied from year to year, as shown in Table 2-130. In 1975 constant dollars, with the exception of the Buckeye and Ashtabula Districts, the 1975 capital outlay allocations of the school districts are small relative to previous years. With its older schools, the Ashtabula District's facilities have need of renovation work. To finance these permanent improvements a three-mill increase in the tax levy was voter-approved in 1975. Over five years, the levy will raise about $2.5 million. In 1975, the Ashtabula District expended, via revenue anticipation notes, approximately $350,000 on permanent improvements. During 1976, the Ashtabula District spent approximately $500,000 on improvements. As indicated in Table 2-130, the Buckeye District's historical information shows consistent levels of capital outlay expenditures from 1973 to 1975 of approximately $100,000, in 1975 constant dollars. The 1977 appropriation shows approximately $170,000 allocated to permanent improvements. Relative to the Conneaut and Ashtabula Districts, the Buckeye District has the tax base necessary to maintain a high level of expenditure. The Conneaut District has shown fluctuation in capital outlay expenditures similar to that evidenced by the school districts in Pennsylvania. District expenditures, in 1975 constant dollars, ranged from $480 in 1972 to $59,000 in 1971. Similarly, the Northwestern District expended $903 in 1972 and $113,738 in 1973; in the latter year, Northwestern built a bus garage. The Fairview and Millcreek Districts' capital expenditures in 1975 were at levels greatly reduced from the preceding years. Annual expenditures for capital outlay 1971-1975 are shown in Table 2-130.

Projections

2.182
Projections of capital costs comprise debt service and net capital outlay. Debt service estimates were taken from the actual debt retirement schedules for the school districts. The annual reduction

Table 2-130
Annual Expenditure for Capital Outlay of Permanent Improvements -- 1971-1975
(1975 Dollars)

	1971	1972	1973	1974	1975
Conneaut Area City(1)	$ 59,458	$ 480	$ 2,483	$ 41,126	$ 55,400
Buckeye Local(1)	N/A	N/A	114,132	110,652	85,597
Ashtabula Area City(1)	N/A	N/A	N/A	N/A	323,539
Northwestern	24,836	903	113,738	10,880	4,350
Girard	30,909	361,368	70,867	64,996	83,525
Fairview	92,368	52,579	325,465	44,394	8,282
Millcreek	620,143	436,754	296,077	188,504	90,960

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(1) Permanent improvement fund on the basis of calendar year.

N/A = Not Available.

Source: Local school district information.

in the Conneaut City Area School District's debt service payments due to declining interest was estimated. Since projected enrollment decline, no new construction is assumed to be undertaken. Capital outlay estimates were derived judgmentally from 1975 and, where appropriate, from available historical information. As noted in the definition of capital costs, there are various categorizations of items considered capital outlay; these were reconciled to approximate an expected allocation. The factors underlying the estimates of capital outlay are as follows:

> With the exception of the Buckeye District, historical averages of capital outlay (1971 to 1975) were considered unacceptable bases for projections because the large annual variation in capital outlay is great (refer to Table 2-130). School officials from several of the school districts expect future capital outlays to continue at low levels. Future site and structure acquisition, which in the past has accounted for high capital outlays, is considered unlikely due to declining enrollments. Projected capital outlays for the Conneaut District and the Pennsylvania school districts are based on recent information rather than on historical trends. In 1975, they expended approximately one percent of their budgets (excluding debt service) for capital outlay items. Site and building acquisition expenditures were not included. It is assumed that these school districts will continue to expend one percent annually for capital outlay. This amount is expected to cover nonrecurring capital items not covered by the equipment allowance in the operating cost estimates. A major item is the purchase of buses. For example, the Fairview District buys two buses every three years (@ $21,000 each). Because the Buckeye District has consistently expended approximately $100,000 between 1973 and 1975 for capital outlay, it is assumed that it will allocate approximately $100,000 annually between 1977 and 1990.
>
> Projections for the Ashtabula District to 1980 are based on an expenditure level resulting from the three-mill permanent improvement levy in effect between 1975 and 1980. In 1976, the Ashtabula District expended about $500,000 of the $2.5 million expected total to be raised by the levy. The Ashtabula District staff expect each of the school years 1977-1979 will show allocations of $500,000. In 1980, a $200,000 allotment will likely remain to be spent.
>
> For the years 1980 to 1990, it is assumed that the Ashtabula District will continue to expend at least 1.5 percent of its annual budget (excluding debt service) for

capital outlay. Although the other school districts, with the exception of Buckeye, are estimated to expend one percent of their budgets annually, the Ashtabula District is expected to need a higher expenditure for continued improvements to its facilities.

This assumption is based on the consideration that the Ashtabula District's facilities are aged and in poor condition and that no new construction is expected to replace the facilities. Hence, the estimate of $50,000 annually is expected to cover nonrecurring expenses such as permanent improvements to buildings. The estimates of the Ashtabula District's operating expenditures contain allowance for $10 per pupil for recurring capital outlay.

The projections of debt service and capital outlay are presented in Table 2-131.

b) Vocational Education

Organization

2.183
Two vocational schools serve the school districts in the Principal Study Area: the Ashtabula County Joint Vocational School (ACJVS) and the Erie County Technical School (ECTS). The county-wide schools are administered independently as vocational education districts; their respective boards of education comprise member school district representatives.

Ashtabula County Joint Vocational School

2.184
The Ashtabula County Joint Vocational School serves the three Ohio school districts in the Principal Study Area: Conneaut Area City, Buckeye Local and Ashtabula Area City. In addition, the ACJVS District includes the remaining school districts in Ashtabula County -- Geneva Area City, Grand Valley Local, Pymatuning Valley Local, St. John's High School in Ashtabula City, and Ledgemont School District in Geauga County. The school is located just outside the corporate limits of Jefferson, which is fairly central to the vocational education district. The longest bus ride for students is 26 miles. The school facility opened in the 1969-1970 school year and has since operated as a branch of each of the 10 high schools in the district; all juniors and seniors from the member schools are eligible to apply for admission. Freshmen and sophomores, if aged 16 or over, are eligible only for the Occupational Work Experience Program. Placement of pupils is based on various indicators of success in training, among which the most important are interest in a vocation and recommendations of home school and vocational school staff. Pupils attend

Table 2-131

Capital Expenditures for Debt Service and Net Capital Outlay -- 1975-1990

(1975 Dollars)

	1975		1980		1985		1990	
School District	Debt Service	Capital Outlay	Debt Service	Capital Outlay	Debt Service	Capital Outlay	Debt Service	Capital Outlay
Local Study Area								
Conneaut	$217,500	$12,000	$140,000	$12,000	$118,000	$12,000	$63,000	$12,000
Northwestern	658,316	10,000	658,316	10,000	658,316	10,000	646,129	10,000
Principal Study Area								
Buckeye	185,772	100,000	144,000	100,000	-0-	100,000	-0-	100,000
Ashtabula	35,941	300,000	-0-	200,000	-0-	50,000	-0-	50,000
Girard	547,000	10,000	547,000	10,000	547,000	10,000	547,000	10,000
Fairview	837,792	15,000	825,350	15,000	753,033	15,000	693,033	15,000
Hillcreek	2,191,214	-0-	2,267,714	-0-	1,842,350	-0-	159,000	-0-

Source: Arthur D. Little, Inc. estimates based on local school district information.

the ACJVS on a full-time basis during a one- or two-year program. Pupils receive their diplomas from their home schools and meet graduation requirements in their home schools during their 9th and 10th grade years. The ACJVS pupils participate in their home school extracurricular activities since none are provided by the ACJVS. Each member school district buses its resident enrollees to and from the school. The school offers programs for high school pupils in six areas: Trade and Industrial Education, Business Education, Distributive Education, Vocational Agriculture Education, Home Economics, and Occupational Work Experience Program (i.e., a work/study program for the potential dropout involving one-half day at a semi-skilled job and one-half day at the school for job-related success training and counselling). The ACJVS also offers a broad program in adult education in the areas of apprenticeship training, manpower retraining, trade extension, courses for dropouts over 18 years of age, and various avocational courses. Certain trade extension courses are supplied by business and industry. One indicator of the school's success is found in a follow-up study of 1975-1976 graduates of the school. Of the 297 pupils available for employment, 82.5 percent were employed full-time while 89 percent were employed full- or part-time. Approximately 60 percent were employed full- or part-time in their field or related field of training.

Erie County Technical School

2.185
The Erie County Technical School is located in a rural area of Summit Township, about 10 miles south of Erie City. The school is fairly central to its service area which includes the four Pennsylvania School Districts in the Principal Study Area (Northwestern, Girard, Fairview, and Millcreek) and the remaining school districts in Erie County, with the exception of Erie City. Twenty different programs are presently offered at the school. The programs or labs are grouped into five major departments: Business, Commercial Foods, Distributive Education, Vocational/Technical, and Health. In addition, the ECTS operates satellite programs which are housed in other locations in the county. The satellite in Corry runs nine programs and has a capacity of 300 students. The ECTS also runs diversified occupation programs in six high schools. These pupils receive job-related training and work 20 hours per week on the job. Three vocational agriculture programs are handled as satellite operations. The ECTS opened its doors to the area's 10th, 11th, and 12th graders in 1968. Not all pupils that wish to attend are accepted due to the facility's limited capacity. A quota is allocated to each participant school district which is based on the percentage of total high school pupils in the service area. The quota applies to the available openings in each lab or shop program. If a lab is undersubscribed by certain districts, the available spaces are reallocated among the member districts' applicants. Although 40 to 50 pupils are

accepted into each of the 20 programs, only half are present at a given time. In 1976, half of the student body attended two weeks full-time at the school and returned the following two weeks to their home schools. The other half of the student body was scheduled alternately. In 1977, the schedule will be changed to a "one-week about" format. In addition to the daytime programs offered at the school, sessions from 3 p.m. to 6 p.m. are available to secondary school students. About 150 pupils participate in late afternoon classes. The school has an occupational placement office to assist job-seeking graduates. Of the 1975 graduates surveyed by the school, 92 percent were employed and of those employed, 78 percent were working in areas related to their training. Adult vocational education is an important aspect of the ECTS. Evening sessions reach about 6,500 adults over the three terms in the year. The classes are free to adult residents of the member school districts. Another adult vocational program administered by the ECTS is the Regional Occupational Skills Center, which offers adult education exclusively. Financing of the local share of construction costs was provided by local industries ($750,000). Adjacent to the ECTS, the Skills Center will open in 1977 to any resident of the Northwest Tri-County Intermediate Unit. The Skills Center has a capacity for 1,000 full-time pupils in two shifts. Programs run from 10 to 16 weeks. Another 1,000 pupils may be handled on a part-time basis in skill improvement programs. A third full-time shift to expand the Center's training capacity is a feasible option. Through the Skills Center, the ECTS officials expect to train people to meet the projected needs for local skilled labor. Based on a comprehensive needs survey of local manufacturers in 1974, the Skills Center will offer training in four major areas: machine shop, welding, industrial maintenance, and metal casting. The Center will identify local skilled labor needs and develop appropriate programs on a continuing basis.

Enrollments and Capacity

2.186

For the two vocational schools, enrollments and capacity are interlinked. Both schools have been at capacity enrollments for several years and have been unable to accommodate student program demand. In the ACJVS's first year of operation (1969-1970), 700 students were enrolled. By the following year, the school's capacity of 850 had been reached. In 1974-1975, the school was able to accommodate 1,050 students by using mobile units as facility extensions. However, following the 1974-1975 school year, the school's Board of Education decided to discontinue the use of mobile extensions and limit enrollments to the facility's capacity of 850. The Board's decision was based on the belief that educational quality had suffered through the strain on the facility's resources. Currently, the school maintains an enrollment of 850 which represents about

22 percent of the 11th and 12th grade pupils in the vocational education district. Based on an interest survey of high school pupils, the Superintendent of the ACJVS believed 1,500 additional pupils wanted to attend the school, but were excluded because of the facility's limited capacity. In 1976, the ECTS facility, excluding the satellite program, handled 400 full-time equivalent pupils. (Actually, 800 part-time students are served via the alternating week sessions.) Like the ACJVS, the ECTS has had daytime enrollments, as full-time equivalents, at capacity levels since the school opened in 1968. School officials have estimated that the ECTS facility currently accommodates about 10 percent of the total county senior high enrollments. An interest survey of 8-10th grade pupils in Erie County's school indicated that 50 percent (about 6,355) were desiring vocational education. One local school district reported an interest level of 81 percent. The ECTS officials project that 1,500 additional pupils would enroll in the school if capacity were expanded. The seven general public school districts in the Principal Study Area contribute about 50 percent of their respective vocational school's enrollments. The satellite facility in Corry, because it does not involve public school districts in the Principal Study Area, is excluded from consideration. Data on 1976 enrollments at the two vocational schools from each of the school districts in the Principal Study Area is presented in Table 2-132. Since the vocational schools have been at capacity for the past few years, the number of students accepted from a given school district has remained fairly constant.

Facilities

2.187

Ashtabula County Joint Vocational School

The 254-acre site of the ACJVS is set in a rural farm area and spaciously accommodates the six single-story brick structures. After construction in 1969, the buildings collectively occupy 218,000 square feet and include 64 classrooms or shop areas. The facility complies with State standards for classroom size by type of activity. The ACJVS Board has consistently determined that three additional buildings were necessary and has placed the requisite tax levy increase on the ballot eight times without success. The three additional buildings would require 110,000 square feet and would cost $2.5 million to construct and equip. The Board proposed financing the additional facilities by a multi-purpose levy at a rate of one mill which would raise $520,000 per year over five years. The multipurpose levy is a finding option open only to vocational schools by Ohio law; the alternative is the usual bond issue. The most recent attempt was in November 1976. Based on the past failures of the measure, it is assumed that the facility will not be expanding during the next 10-15 years.

Table 2-132

Vocational School Enrollments(1) from Public School Districts in the Local and Principal Study Areas -- 1976, 1981 and 1990

Vocational School(2)	Public School District	Vocational School Enrollments 1976	1981	1990
Ashtabula County Joint Vocational School	Conneaut Area City	120	120	120
	Buckeye Local	94	94	94
	Ashtabula Area City	200	200	200
	Total	414	414	414
Erie County Technical School	Northwestern	36	72	72
	Girard	35	70	70
	Fairview	28	56	56
	Millcreek	118	236	236
	Total	217	434	434

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(1) Given as full-time equivalent enrollments.

(2) Total full-time equivalent enrollment at the ACJVS was 850 in 1976 and expected to remain at that level. Total full-time equivalent enrollment at ECTS in 1976 was 400. In 1981, the expanded facility will allow 800 full-time equivalent pupils.

Source: Arthur D. Little, Inc. estimates based on local school district information.

Erie County Technical School

2.188
The two one-story structures of the ECTS and the Regional Occupational Skills Center occupy a 167-acre site. The ECTS was built in 1968 at a cost of $3 million including equipment and contains 20 work areas or classrooms. According to ECTS officials, plans for expansion are being considered. Twenty additional labs would provide both new training courses and expand the capacity of existing training courses. An estimated 800 additional half-time students could be served in alternating week sessions. The expansion would double the school's capacity. At this time, no specific construction details or costs have been developed for the additional facilities. However, school officials expect the addition of the 20 labs will be undertaken by 1981.

Staff

Ashtabula County Joint Vocational School

2.189
The ACJVS currently has a total staff of 110. Full-time classroom teachers number 72 and include nine teachers of academic subjects. The five departments of instruction are headed by full-time directors. Overall administration includes the Superintendent, a vocational director, and a principal. In addition, three counsellors, one clerk-treasurer, and one nurse are employed. Other support staff include 12 custodial and four cafeteria workers. These personnel are supplemented by students who work as part of their training program. Since the school is presently at capacity and not expected to expand, the existing staff levels are assumed to remain constant from 1979-1990.

Erie County Technical School

2.190
The ECTS staff is expected to nearly double in 1981 with the facility's expansion. The estimates of pupils per instructional staff member are based on the Pennsylvania Department of Education standard of 20 pupils per classroom in vocational schools. Consequently, 40 instructors are needed in 1981 for 800 full-time equivalent pupils. This figure is double the required number prior to facility expansion. Seven administrators are currently employed. They include a superintendent, three counsellors, an accountant, a principal, and a supervisor. The number of administrative staff is also expected to double in 1981 as more supervisory staff and counsellors are required. Similarly, the support staff which numbers approximately 12, is expected to increase to 24 in 1981.

Operating Costs

2.191
Estimates of operating costs have been determined for each vocational school: $2,297 per pupil at the ACJVS and $2,267 per pupil at the ECTS. Operating costs estimates include expenditures for instruction, administration, operation, and maintenance of the school plant, fixed charges, health and auxiliary services, transportation, pupil personal services, and activities. Excluded from operating expenditures are debt service, food services, and adult education. The estimates are based on full-time equivalent enrollments. Also included is an annual average capital outlay of $100 per full-time equivalent pupil. This figure is based on the estimate of an ECTS official that, over the past several years, ECTS has allocated about $40,000 annually to replacing equipment for daytime pupils which, as full-time equivalents, number 400. ACJVS operating costs in 1975-1976 ($2,297 per pupil) were rated as the highest in Ohio where vocational schools averaged $1,722 for operating expenditures (plus $545 for capital outlay). (2-11) In projecting operating costs to 1990, no annual increase, in 1975 dollars, is assumed. As both school's enrollments are expected to remain at capacity, fluctuation due to decreasing enrollments is not a factor. Although pupil-to-teacher ratios, according to officials of both schools, should be lowered, the hiring of additional staff is not the problem. The real problem is limited classroom space. Hence, it is assumed that the 1981 expansion of the ECTS will double total operating expenditures but the per-pupil cost will remain constant. This is based on the consideration that the ACJVS, which is 2.1 times the size of the ECTS, expends just $30 more per pupil (in 1975 constant dollars).

Capital Costs

Ashtabula County Joint Vocational School

2.192
Funding for new construction of vocational schools in Ohio is shared: 50 percent Federal-State and 50 percent local. In 1975-1976, the school showed no indebtedness.

Erie County Technical School

2.193
ECTS construction programs are eligible for State and Federal subsidies amounting to approximately 75 percent of total costs. As the ECTS lies within the Appalachian region, it is eligible for 25 percent Federal funding for constructing facilities. State funding is determined by the combined State aid ratios for the member districts, which for the ECTS amounts to 50 percent in State funds. The

remaining 25 percent is the responsibility of the member school districts which share rental costs according to the number of pupils attending the ECTS. Annual rent payments for the ECTS facility amount to about $221,769. The final payment will be made in five years. However, with construction of the additional facilities by 1981, a new debt will be incurred. Since the ECTS has not calculated construction costs to date, the projected capital expenditures have been estimated. As the additional labs will double the number of shop areas, it is assumed that the instructional area will also double. The current instructional area is 45,000 square feet and the 1981 addition will also amount to 45,000 square feet. At an assumed value of $58 per square foot, the project would cost approximately $2.6 million, in 1975 constant dollars, to construct and equip. Estimates of the annual payments assume the payments are distributed over a 15-year period, as was the cost of the 1968 facility, a 5.5 percent interest rate, and a "declining balance" amortization schedule. The total rental obligations for the ECTS as projected to 1990 are shown in Table 2-133.

c) Nonpublic Schools

2.194
The estimates of the percentage of school-age population attending nonpublic schools in years 1979-1990 are presented in Table 2-134. In 1975, an estimated 3.4 million nonpublic pupils comprised 10 percent of all elementary school pupils (ages 5-13) in the United States. In 1975, secondary pupils (ages 14-17) were estimated to constitute 7.3 percent of the U.S. 14-17 population age group or approximately eight percent of those enrolled in secondary schools. (2-12) A corollary assumption is that nonpublic enrollments will decline commensurate with public enrollments. In 1975-1976, Pennsylvania enrollments in both public and nonpublic schools declined 1.3 percent.

Local Study Area

2.195
There are three nonpublic schools in the Local Study Area. In the Conneaut Area City School District are St. Francis Cabrini and Southridge Christian Academy, and the Cranesville Bible Church School in Cranesville is in the Northwestern School District. Each of these schools is a small parochial elementary school, and accepts students from a fairly broad area. For example 22 children from the Northwestern School District attend either the St. Francis Cabrini School or Southridge Academy in the Conneaut Area City School District. The Cabrini School, which merged with St. Mary's in 1971, has been experiencing declining enrollments over the past 10 years. As shown in Table 2-135, the annual decrease has ranged from two

Table 2-133

Erie County Technical School Capital Expenditures -- 1975 and 1979-1990

(1975 Dollars)

Year	Capital Expenditure
1975	$221,769
1979	221,769
1980	221,769
1981(1)	538,102
1982	528,569
1983	297,266
1984	287,733
1985	278,200
1986	268,666
1987	259,133
1988	249,600
1989	240,066
1990	230,533

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(1) 1981 is the assumed year of the ECTS expansion.

Source: Arthur D. Little, Inc. estimates.

Table 2-134

Percentage of Population Age Group Attending Nonpublic Schools -- 1979-1990

School District	Educational Level	Age Group	Percentage Attending Nonpublic Schools
Local Study Area			
Conneaut Area City	Elementary	5-11	9.7%
	Junior High	12-14	4.9
	Senior High	15-17	1.1
Northwestern	Elementary	5-11	2.2
	Junior High	12-14	1.4
	Senior High	15-17	1.4
Principal Study Area			
Buckeye Local	Elementary	5-11	1.5
	Junior High	12-14	0.5
	Senior High	15-17	0.3
Ashtabula Area City	Elementary	5-13	15.3
	Senior High	14-17	12.7
Girard	Elementary	5-10	9.0
	Middle	11-13	9.9
	Senior High	14-17	1.0
Fairview	Elementary	5-10	7.4
	Middle	11-13	0.5
	Senior High	14-17	0.9
Millcreek	Elementary	5-11	21.3
	Junior High	12-13	21.8
	Senior High	14-17	17.1

Source: Arthur D. Little, Inc. estimates based on local school district information.

Table 2-135

Fall Enrollments in St. Francis Cabrini School -- 1965-1976

Year	No. of Pupils
1965-66	251
1966-67	256
1967-68	250
1968-69	229
1969-70	204
1970-71	188
1971-72	111
1972-73	253(1)
1973-74	242
1974-75	228
1975-76	217
1976-77	212

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(1) Consolidation of Conneaut parochial schools occurred in 1972-73.

Source: St. Francis Cabrini School.

percent to six percent since 1972. Although the Cabrini School has the capacity to accept some additional pupils, limited revenue sources will likely preclude any expansion of facilities should enrollments greatly increase. About 75 percent of operating costs are funded by contributions from Conneaut Catholic parishes and donations, while tuition revenues support 25 percent. Current tuition rates are $130 per term for parishioners and $180 per term for non-parishioners. The Cabrini School offers some State-funded auxiliary services, e.g., speech therapist. In addition, the Conneaut Area City School District provides transportation within the district for Cabrini pupils and acts as fiscal agent for the auxiliary services. Due to Ohio regulations, auxiliary services may not be offered on church property; consequently, they are housed in a mobile home situated in close proximity to the school building.

Principal Study Area

2.196
The nonpublic schools in the Principal Study Area include the following:

St. John's School in the Girard School District serves grades 1-8. (Its 168 pupils in 1976 included 18 children from the Northwestern School District).

The Temple Christian and St. Stephen's School enrollments include 60-80 children of the Fairview District. The St. Stephen's School offers only pre-school and kindergarten classes; Temple Christian serves grades K-3.

The four Catholic elementary schools in the Millcreek School District are administered by the Diocese of Erie. Total 1976-1977 enrollment was 2,492, or about 23 percent of total enrollment in the Millcreek School District. Many of these pupils are presumed to come from outside the boundaries of the Millcreek School District. For example, after third grade, Catholic students in the Fairview School District begin to attend Catholic school in the Millcreek District.

There are 10 nonpublic secondary schools in Erie County which a few pupils from the Principal Study Area attend, but only St. Mark's Seminary lies within the Principal Study Area. Four nonpublic schools in Ashtabula Area City School District include three elementary schools and one high school: Our Lady of Mt. Carmel (K-8), St. Joseph's (1-8), Mother of Sorrows (1-8), and St. John's High School. Together the three elementary schools in 1976 enrolled 675 pupils, while St. John's enrolled 475 pupils.

There are no nonpublic schools located in Buckeye Local School District. The 73 nonpublic pupils residing in Buckeye are presumed to attend schools in Ashtabula City or in Conneaut City.

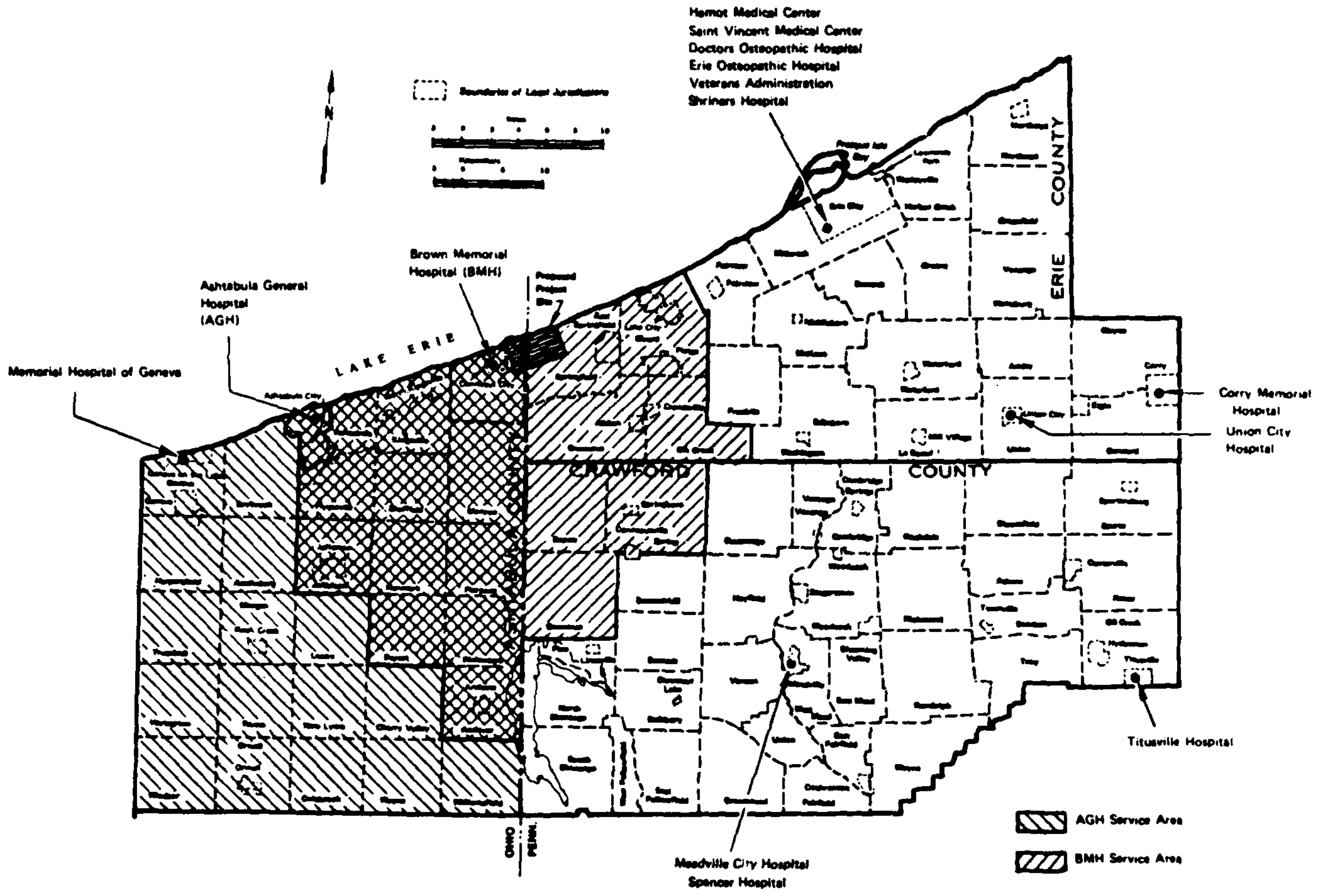
Health Care

a) Hospitals

2.197
There are 14 hospitals in the Regional Study Area -- one in the Local Study Area (Conneaut), seven in the Principal Study Area, and six in the rest of the Regional Study Area. Three of these hospitals are located in Ashtabula County, eight in Erie County, and three in Crawford County. The locations of these hospitals are shown in Figure 2-10. For the purpose of this discussion only the hospital facilities in Ashtabula and Erie Counties will be discussed in detail. Hospitals in Crawford County will be discussed in lesser detail since they are well removed from the proposed plant site and are not located within communities which will experience significant population impact. General information on the 14 Regional Study Area hospitals is provided in Table 2-136.

Ashtabula County

2.198
The three hospitals in Ashtabula County are private, acute care, general medical and surgical facilities with obstetrics and pediatrics. Brown Memorial Hospital (BMH) is a 75-bed facility located in Conneaut. In 1975 nearly 3,000 patients were admitted and almost 7,500 patients were treated in the emergency room. Ashtabula General Hospital (AGH), the 235-bed facility in Ashtabula City, admitted almost 10,000 patients and treated almost 20,000 persons in its emergency room in 1975. The 47-bed Memorial Hospital of Geneva (MHG) had 2,000 admissions and 6,000 emergency room visits in 1975. Specific information for each of these hospitals is presented in Tables 2-137, 2-138, and 2-139, respectively. All three hospitals provide continuous physician coverage in their emergency rooms. Ashtabula General also has in-patient psychiatric services. The 1975 occupancy rates for BMH, AGH, and MHG were 70 percent, 82 percent, and 60 percent, (2-13), respectively, all slightly above the national average for hospitals of similar size. (2-14) Brown Memorial Hospital has just contracted for the construction of its Phase I building program, which is basically a renovation plan. It calls for the replacement of non-conforming beds and a very old and inefficient wing which also houses fiscal and administrative space. (2-15) Overall, an additional 11 medical/surgical beds will be constructed,



Source: Ashtabula General Hospital Annual Report, 1976; Brown Memorial Hospital Annual Report, 1976.

FIGURE 2-10 LOCATION OF HOSPITALS WITHIN THE REGIONAL STUDY AREA

Table 2-136

Data for Hospitals in Ashtabula, Erie, and Crawford Counties -- 1975

Hospital	County	Municipality	Ownership	No. of Beds	% Occupancy
Local Study Area					
Brown Memorial	Ashtabula	Conneaut	Private	75	69.7%
Principal Study Area					
Ashtabula General	Ashtabula	Ashtabula City	Private	225	82.0
Hamot Medical Center	Erie	Erie	Private	531	85.0
Saint Vincent Health Center	Erie	Erie	Private	463	86.0
Veterans Administration Hospital	Erie	Erie	Federal	174	94.0
Doctors Osteopathic Hospital	Erie	Erie	Private	163	68.0
Erie Osteopathic Hospital	Erie	Erie	Private	113	49.0
Shriners Hospital for Crippled Children	Erie	Erie	Private	30	79.0

Table 2-136 (Continued)

Hospital	County	Municipality	Ownership	No. of Beds	% Occupancy
Rest of the Regional Study Area					
Memorial Hospital of Geneva	Ashtabula	Geneva	Private	47	60.2%
Corry Memorial	Erie	Corry	Private	75	64.0
Union City Memorial Hospital	Erie	Union City	Private	25	89.0
Meadville City Hospital	Crawford	Meadville	Private	172	71.8
Spencer Hospital	Crawford	Meadville	Private	161	77.0
Titusville Hospital	Crawford	Titusville	Private	99	46.4

Source: Ashtabula County hospitals - individual hospital annual reports, 1976; Erie County hospitals - Erie County Community Health Profile, April 1976, revised April 1977 by Health Systems, Inc., of Northwestern Pennsylvania; Crawford County hospitals - AHA, Guide to the Health Care Field, 1975.

Table 2-137

Brown Memorial Hospital Data -- 1975

Beds and Utilization

Service	No. of Beds	% Occupancy
Combined Coronary Care and Intensive Care	6	46.8%
Medical--Surgical	61	75.4
Obstetrics	8	43.9
Newborn and Premature Nursery	16	23.1
Hospital Total (Adult beds -- does not include nursery beds)	75	69.7%

Selected Hospital Statistics

Admissions	2,962
In-patient Days of Hospital Service	19,094
Emergency Room Visits	7,449
Births	252
Average Length of Hospital Stay	6.6 days (excludes newborn totals)
Number of Full-time Employees Requiring Specific Health Training	

Facilities and Programs

Blood Bank
Combined Intensive Cardiac Care Unit and Intensive Care Unit
Emergency Department
Hospital Auxiliary
Medical Records Unit
Pharmacy
Physical Therapy Services (in-patient)
Home Care Service
Physical Therapy Services (out-patient)
Podiatry Services
Postoperative Recovery Room
Respiratory Therapy Services
Speech Therapy Services (in-patient)
Volunteer Services

Table 2-137 (Continued)

Facilities and Programs Planned Within Five Years

Histopathology Lab
Social Service
Speech Therapy Services (out-patient)

Medical Staff

Active medical staff	13
Consulting medical staff	8
Courtesy medical staff	2

Specialists on Staff

General Practice
Internist
Pathologist
Radiologist
Roentgenologist
Surgeon
Cardiologist

Accreditation

Joint Commission on the Accreditation of Hospitals

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio, April 1977.

Table 2-138

Ashtabula General Hospital Data -- 1975

Beds and Utilization

Service	No. of Beds	% Occupancy
Medical-Surgical	179	91.8%
Obstetrics	27	31.7
Pediatrics	19	56.8
Newborn Nursery	26	26.9
Premature Nursery	4	21.9
Hospital Total (Adult beds-- does not include nursery beds)	225	82.0%

Selected Hospital Statistics

Admissions	10,767
In-patient Days of Hospital Service	67,063
Emergency Room Visits	19,935
Births	691
Average Length of Hospital Stay	7.0 days (excludes newborn totals)
Number of Full-time Employees Requiring Specific Health Training	116

Facilities and Programs

Blood Bank
Chaplain Services
Combined Intensive Cardiac Care and Intensive Care Unit
Dental Services
Diagnostic Radioisotope Facility
Emergency Department
Histopathology Laboratory
Hospital Auxiliary
Medical Library
Medical Records Unit
Occupational Therapy Services (in-patient)
Occupational Therapy Services (out-patient)
Electroencephalography
Pharmacy

Table 2-138 (Continued)

Facilities and Programs (Continued)

Physical Therapy Services (in-patient)
Physical Therapy Services (out-patient)
Postoperative Recovery Room
Premature Nursery
Psychiatric Out-patient Unit - (Through Ashtabula Mental Health)
Radium Therapy
Respiratory Therapy Services
Social Service
Therapeutic Radioisotope Facility
Volunteer Services
X-ray Therapy (other than megavoltage)

Medical Staff

Active medical staff	41
Associate staff	12
Consulting medical staff	4
Courtesy medical staff	2

Specialists on Staff

Anesthesiologist
Gynecologist
Internist
Neurologist
Obstetrician
Ophthalmologist
Orthopedist
Otorhinolaryngologist
Pathologist
Pediatrician
Psychiatrist
Radiologist
Roentgenologist
Surgeon
Urologist

Accreditation

Joint Commission on the Accreditation of Hospitals

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio,
April 1977.

Table 2-139

Memorial Hospital of Geneva Data -- 1975

Beds and Utilization

Service	No. of Beds	% Occupancy
Combined Cardiac Care and Intensive Care	2	50.4%
Medical-Surgical	40	62.1
Obstetrics	5	48.7
Newborn Nursery	9	24.6
Hospital Total (Adult beds -- does not include nursery beds)	47	60.2%

Selected Hospital Statistics

Admissions	2,033	
In-patient Days of Hospital Service	10,320	
Emergency Room Visits	6,239	
Births	197	
Average Length of Hospital Stay	5.1 days	(excludes newborn totals)
Number of Full-time Employees Requiring Specific Health Training	38	

Facilities and Programs

Blood Bank
Combined Intensive Cardiac Care and Intensive Care Unit
Emergency Department
Hospital Auxiliary
Medical Records Unit
Medical Library
Pharmacy
Postoperative Recovery Room
Volunteer Services

Table 2-139 (Continued)

Medical Staff

Active medical staff	8
Consulting medical staff	14
Dental staff	2

Specialists on Staff

Anesthesiologist
Gynecologist
Internist
Obstetrician
Orthopedist
Pathologist
Pediatrician
Radiologist
Surgeon

Accreditation

Joint Commission on the Accreditation of Hospitals

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio, April 1977.

bringing the total to 86, plus two labor beds and 16 bassinettes for neonatal care. Emergency, out-patient, laboratory, and X-ray facilities will also be expanded. Phase I is expected to be completed by late 1979. Ashtabula General Hospital is in the last year of a three-phase, 10-year facilities reconstruction program. (2-16) This final phase includes expansion of central materials handling, central sterile services, the pharmacy, housekeeping and maintenance services, storage, employee locker rooms, a new lobby, and space for future laboratory expansion. Also included is renovation of pediatrics, labor and delivery, and office space. There are no plans for expansion or renovation at Memorial Hospital of Geneva. (2-17) About 73 percent of Brown Memorial Hospital's patients come from Conneaut, and another 4.5 percent from Springfield. (2-18) Residents of the Ohio Principal Study Area account for another 18 percent of the hospital's admissions including approximately five percent from Kingsville and four percent from Ashtabula. Almost all of Ashtabula General Hospital's patients are residents of Ashtabula County. (2-19) The majority (almost 66 percent) come from Ashtabula City and Township. Nearly seven percent come from Conneaut, and an additional 15 percent from other parts of the Ohio Principal Study Area. The geographic distribution of Ashtabula General Hospital and Brown Memorial Hospital admissions during 1976 are presented in Table 2-140. A complete geographical distribution of MHG's patients is not available; however, most of the patients are believed to come from the northwest corner of Ashtabula County (especially Geneva, Geneva-on-the-Lake, Saybrook, and Harpersfield) and the northeast corner of Lake County (especially Madison and Woodworth). Although there is an increase in population in this area during the summer, the hospitals do not experience seasonal increases in admissions. National statistics show that hospitals in cold climates usually have a maximum number of admissions in winter and a minimum in summer, whereas in Ashtabula County admissions remain fairly constant throughout the year. Quite possibly, the increased summer population balances what would otherwise be a reduced requirement for medical services. Overall, Ashtabula County has a total of about 3.5 hospital beds per 1,000 population, while the State of Ohio has about 4.8 medical and surgical beds per 1,000 population.

Erie County*

2.199
Six of the eight hospitals in Erie County are private, acute care, general medical/surgical facilities with obstetrics and pediatrics

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*Data for all Erie County hospitals are derived from Erie County Community Health Profile, April 1976, revised April 1977 by Health Systems, Inc., of Northwestern Pennsylvania

Table 2-140

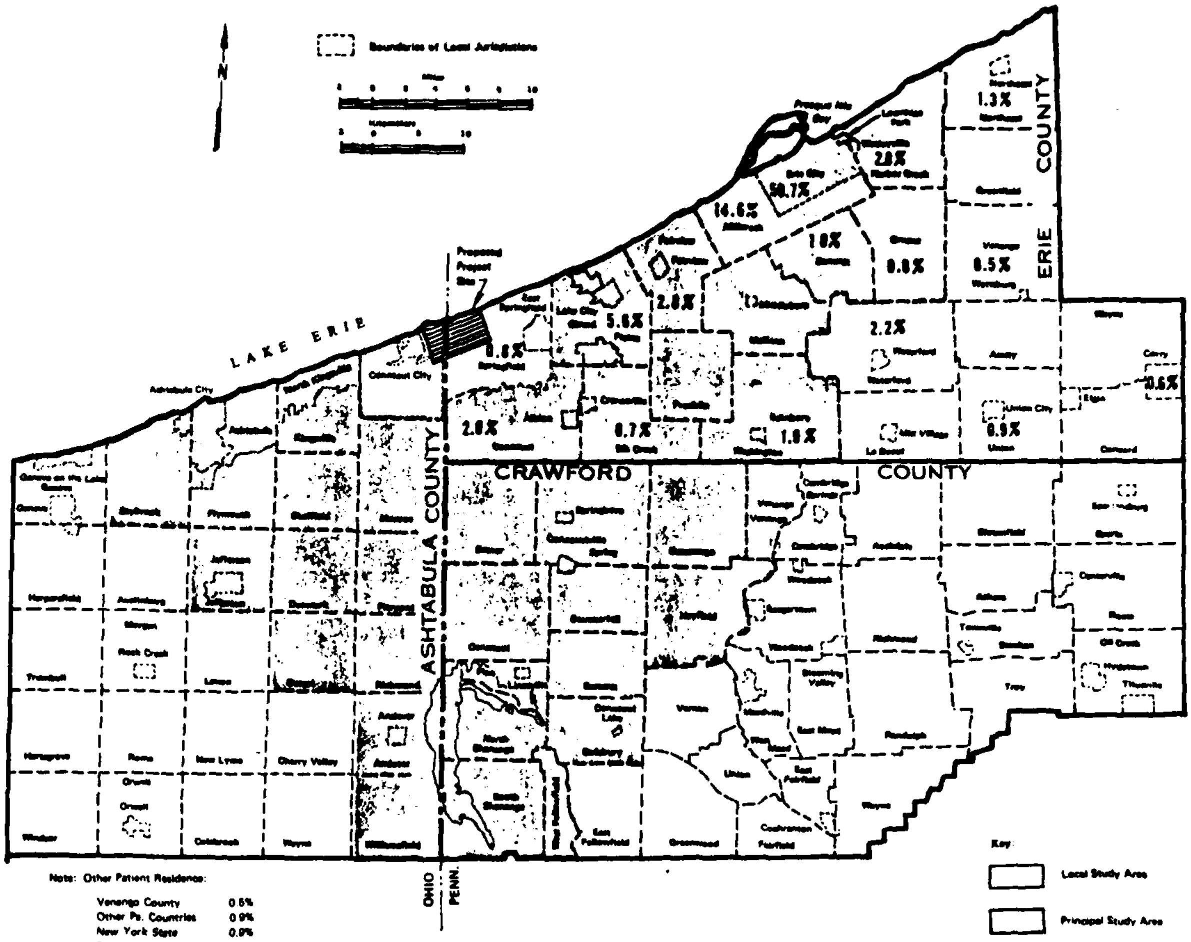
Geographic Distribution of Ashtabula General and Brown Memorial Admissions -- 1976

	Brown Memorial Hospital		Ashtabula General Hospital	
Local Study Area				
Conneaut	2,169	73.2%	710	6.6%
Springfield	134	4.5	-	-
Ohio Principal Study Area				
Kingsville (Township and N. Kingsville Village)	151	5.1	410	3.8
Ashtabula (Township and City)	128	4.3	7,060	65.6
Saybrook	-	-	-	-
Rest of Ohio Principal Area	157	5.3	1,256	11.6
Pennsylvania Principal Study Area				
Girard	26	0.9	-	-
Fairview	-	-	-	-
Millcreek	-	-	-	-
Rest of Pennsylvania Principal Area	75	2.6	-	-
Regional Study Area				
Ohio	-	-	977	9.1
Pennsylvania	-	-	-	-
Other	122	4.1	354	3.3
Total	2,962	100.0%	10,767	100.0%

Source: Brown Memorial Hospital and Ashtabula General Hospital annual reports, 1976.

services. The Veterans Administration Hospital is a Federally owned facility and the Shriners Hospital for Crippled Children is a small, private pediatric facility specializing in rehabilitation. Erie County had a total of 1,574 hospital beds in 1975 (refer to Table 2-136). Hamot Medical Center (HMC), with 531 beds, and Saint Vincent Health Center (SVHC), with 463 beds, provide comprehensive general health care services and many specialized services including burn care, coronary care, intensive medical/ surgical care, neonatal intensive care, open-heart surgery, and renal dialysis. In 1975 HMC admitted 20,000 patients and had 42,000 emergency room visits; SVHC had 18,000 and 43,000, respectively. The overall occupancy rate is 85 percent for HMC and 86 percent for SVHC.

The Doctors Osteopathic Hospital (DOH), with 163 beds, and Erie Osteopathic Hospital (EOH), with 113 beds, provide general health services to the city of Erie. In 1975, DOH had 6,000 admissions and 11,000 emergency room visits and EOH had 3,000 and 4,000, respectively. The occupancy rate was 68 percent at DOH and 49 percent at EOH. The Veterans Administration (VA) hospital in the city of Erie has 174 beds and provides general medical and surgical services to veterans and other eligible patients. The VA admitted 1,900 patients in 1975. However, this facility offers no emergency room services. The hospital maintains a high occupancy rate of 94 percent due primarily to the large number of chronic patients and the low turnover typical of VA facilities. The Shriners Hospital (SH), with 30 beds, provides principally physical medicine and orthopedic services to children. SH had 300 admissions in 1975, has no emergency room, and maintains a 79 percent occupancy rate. Corry Memorial Hospital (CMH), with 75 beds, and Union City Hospital (UCH), with 25 beds, are the two facilities in the county not located in the city of Erie. CMH had 3,200 admissions and 4,700 emergency room visits in 1975; UCH had 1,500 and 5,000, respectively. Both hospitals reduced the number of beds between 1974 and 1975 and increased occupancy (from 58 percent to 64 percent at CMH and from 52 percent to 89 percent at UCH). Hamot Medical Center will be completing a $50 million renovation in July 1978. This building program includes replacement of 350 beds, construction of a new burn unit and new surgical suite, and overall modernization of the entire facility. Saint Vincent Health Center, Doctors Osteopathic Hospital, and Union City Hospital have recently completed minor renovation programs. CMH, VA, and SH already have conforming structures not in need of improvement. No other major renovations are presently planned in Erie County once HMC is completed. The geographic distribution of patient residence for the SVHC is shown in Figure 2-11. More than 50 percent of the patients come from the city of Erie, 23 percent from Millcreek, Fairview, and Girard Townships, and 0.8 percent from the Local Study Area of Springfield. Although detailed data about patient residence for HMC



Note: Other Patient Residence:

Venango County	0.6%
Other Pa. Countries	0.9%
New York State	0.9%
Ohio	2.2%
Other States	0.3%
Unidentified	0.8%

Source: Health Systems, Inc., of Northwestern Pennsylvania.

FIGURE 2-11 PATIENT RESIDENCE ANALYSIS FOR SAINT VINCENT HEALTH CENTER

are not available, it is believed that the distribution is similar to that of SVHC. However, with completion of the major renovation at HMC, the distribution may gradually change. HMC will become a major referral center for Erie County, while reducing some of its primary care services. It is believed that DOH and EOH have patient distributions similar to SVHC and are not likely to change significantly. It is also assumed that the VA and SH draw patients from a large area and since they have a very low patient turnover they do not affect acute health care facility use significantly (although distribution data are not available to confirm this assumption). In 1975 Erie County had a total of 4.5 beds (medical, surgical, and pediatric) per 1,000 population, compared to a Statewide average of 5.0 (2-20). If all hospital beds are included, Erie County has approximately 5.8 beds per 1,000 population.

b) Long-Term Care Facilities

2.200
There are 31 existing long-term care facilities with a total of approximately 3,000 beds in Ashtabula and Erie counties, and a waiting list of approximately 800 persons. Successful completion of planned nursing home bed additions in this area would nearly eliminate the current waiting list problem. However, financial difficulties have delayed construction in many instances.

Ashtabula County

2.201
A complete list of the 13 long-term care facilities in Ashtabula County is shown in Table 2-141. There are no facilities in the Ohio Local Study Area; the nearest facilities are located in Ashtabula City. There are three homes with a total of approximately 450 beds in the Ashtabula City area including one 217-bed county home, a 200-bed proprietary home, and a 29-bed philanthropic home. Except for the small home, all the beds are certified skilled intermediate care nursing beds for Medicare and Medicaid. At the time of the last comprehensive local survey (2-217) of bed needs in the fall of 1976, there were 165 people on the waiting list for the two large nursing homes in Ashtabula. In the rest of Ashtabula County, there was a total of 680 additional beds in 1976 with a waiting list of 108. Most of these additional beds are located in Geneva. The 12 certified nursing homes (excluding those classified as small home) have a total of 1,097 beds and an occupancy rate of 96.9 percent. (2-13) This high patient census accounts for the long waiting list. However, in spite of this waiting list, hospital personnel experience little difficulty in transferring hospital patients to nursing homes. Delays that do occur in placement are most often encountered for

Table 2-141

Ashtabula County Long-Term Care Facilities -- 1976-1977

Facility	Ownership(1)	Capacity	Approved New Beds	Cert SNF(2) XVIII(3)	Cert SNF(2) XIX(4)	ICF(5)
Ashtabula County Nursing Home	CTY	217	+128	-	167	167
Ashtabula Medicare Nursing Center	P	200	-	100	100	-
Autumn Rendezvous	P	78	-	-	78	-
Broadway Home	P	87	-	-	-	87
Catherine Ellen Convalescent Home	P	16	-	-	-	16
Char-Lotte Nursing Home, Inc.	P	108	-	-	96	12
Char-Lotte Nursing Home, Inc.	P	28	- 12	-	-	- 28
Con-Lea Nursing Home, Inc.	P	42	+ 50	-	-	42
Geneva Medi-Care Nursing Center	P	99	+ 51	99	99	-
Homestead	P	50	-	-	-	50

Table 2-141 (Continued)

Facility	Ownership[1]	Capacity	Approved New Beds	Cert SNF[2]		ICF[5]
				XVIII[3]	XIX[4]	
Manor Rest Home	P	72	-	-	-	50
The Smith Home for Aged Women	PH	29	-	-	-	-
Town Hall Estates-Nursing Home	PH	100	-	-	-	100
Total		1,126	217	199	540	502

(1) Ownership = CTY = Country; P = Proprietary Home; PH = Philanthropic.
(2) Cert SNF = Certified Skilled Nursing Facility.
(3) XVIII = Medicare.
(4) XIX = Medicaid.
(5) ICF = Certified Intermediate Care Facility.

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio, April, 1977.

patients requiring skilled nursing care under Medicaid. A total of 367 new beds has been approved for construction in Ashtabula County including 150 for two new facilities and a change of 217 for additions/deletions to existing nursing homes. Once completed, these 367 beds are expected to eliminate the current waiting list.

Erie County

2.202
A complete list of the 20 long-term care facilities in Erie County is presented in Table 2-142. There are currently 17 nursing homes, one hospital extended care unit in the VA Hospital, and two planned and approved facilities to be constructed. The 18 existing facilities in Erie County are operating at 96 percent average occupancy. In addition, a total of 322 beds have been approved for expansion in two existing facilities. Completion of all planned construction would increase Erie County long-term bed capacity from the current 2,001 to 2,586. These additional 585 beds would eliminate the current list of 535 persons waiting for placement in these homes.

c) Health Manpower

2.203
Overall, health manpower is not sufficient to serve all of the health care needs of Ashtabula and Erie Counties. There is a general lack of physicians and paraprofessionals (physical therapists, occupational therapists, physician assistants, etc.), although the number of dentists are comparable to Statewide levels.

Ashtabula County

2.204
There were 57 physicians, including medical doctors (MDs) and osteopathic doctors (DOs) in active practice in Ashtabula County in 1975. Of these physicians, 35 (0.35 per 1,000 population) are classified as primary care physicians which include general practitioners, family practitioners, internists, obstetricians/gynecologists, and pediatricians. A comparison of existing ratios of primary care physicians to population is presented in Table 2-143. In 1976 and 1977, new physicians were recruited by Ashtabula General and Brown Memorial hospital administrators because of the inadequate physician manpower throughout the county. Considering all physicians (primary care and specialists), the current ratio is 0.84 per 1,000 population, compared to a 1975 level of 0.57 per 1,000. The Ohio Statewide average is 1.48 physicians per 1,000 population, (2-22) and for the United States as a whole the average physician-to-population ratio for non-metropolitan counties is 0.91 per 1,000. (2-23) In

Table 2-142

Erie County Nursing Homes

Facility	Capacity	Approved New Beds	Type of Care Provided
Alpine Manor Conv. Home	29	91	SNF(1)
Battersby Conv. Home, Inc.	129	231	SNF
Medi-center Inc.	to be built	180	SNF/ICF(2)
Conrad House	to be built	83	SNF/ICF
Erie County Home and Hospital	533	-	SNF/ICF/RES(3)
Erna's Rest Home	5	-	RES
Gilpen Manor	9	-	RES
Lutheran Home for Aged	100	-	SNF/ICF/RES
Manor Home for Aged	33	-	ICF
Medicenter Hospital	103	-	SNF
Presbyterian Lodge	38	-	RES
Rondale Nursing Home	80	-	SNF
St. Mary's Geriatric Hospital	310	-	SNF/ICF/RES
Sarah A. Reed Home	125	-	SNF/ICF/RES

Table 2-142 (Continued)

Facility	Capacity	Approved New Beds	Type of Care Provided
Shorehaven Senior Citizen Home	10	-	RES
Soldiers and Sailors Home	200	-	SNF/RES
Twinbrook Nursing Home	105	-	SNF
Veterans Admin. Hospital.	40	-	SNF/ICF/RES
Webster Memorial Presbyterian Home	20 -	-	RES
Western Reserve Convalescent Home	132	-	SNF/ICF
Total	2,001	585	

(1) SNF = Skilled Nursing Facility.
(2) ICF = Certified Intermediate Care Facility.
(3) RES = Residential.

Source: Erie County Community Health Profile, Health Systems, Inc. of Northwestern Pennsylvania.

Table 2-143

Primary Care Physicians Per 1000 Population in Ashtabula County -- 1975

Primary Care Physical Type	Ashtabula County Ratio	Recommended Ratio Range	
		Low	High
General/Family Practice and Internist	0.24	0.40	0.50
Obstetrics/ Gynecologists	0.07	0.09	0.11
Pediatrician	0.04	0.16	0.20

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio, April 1977.

1974, there were 18 primary care physicians (51 percent) over 50 years old and 10 (29 percent) over 60 years old. In 1976, there were 40 dentists (0.40 per 1,000 population) in Ashtabula County which is the ratio recommended by the local health planning agency; the Ohio Statewide average is 0.50 per 1,000. The nurse-to-population ratio is 3.54 nurses per 1,000 compared to a Statewide average of 3.91 per 1,000. (2-22) To provide some basis for comparison, the number of physicians in Ashtabula County was compared to those in nearby Trumbull and Columbiana Counties. In 1975 Trumbull County had 210 physicians of whom 101 (one per 2,376 people) were primary care physicians. Ashtabula County had 57 physicians, of whom 35 (one per 2,857) were primary care specialists; Columbiana County had 72 physicians, including 42 (one per 2,643) primary care practitioners. Thus, Ashtabula ranked below both of the other counties in terms of the ratio of physicians to population. The percentage of primary care physicians over 60 years of age was 33 percent in Columbiana, 29 percent in Ashtabula, and 18 percent in Trumbull.

Erie County

2.205
Erie County had 293 primary care and specialist physicians in 1975, for a ratio of 1.09 physicians (medical doctors and osteopathic doctors) per 1,000 population; the Pennsylvania Statewide average was 1.65 per 1,000. The distribution of physicians by specialty in Erie County is presented in Table 2-144 while Table 2-145 shows the geographic distribution of the 293 physicians throughout Erie County. It can be seen that more than 81 percent of the physicians are located in Erie City, while only about 50 percent of the county's population resides there. Thus, the physician shortages reported for Erie County as a whole are more severe for rural areas, which is a typical finding throughout the United States. For example, there is one physician listed in each of the towns of Girard, Lake City, and West Springfield. The dentist-to-population ratio in 1975 was 0.57 per 1,000 population compared to an Ohio Statewide average of 0.59 per 1,000. (2-22) Table 2-146 shows how the 151 dentists are divided by specialty and Table 2-147 shows the geographic distribution of dentists who appear to be somewhat better distributed than physicians. The nurse-to-population ratio in the county was 5.3 per 1,000 population compared to a Statewide average of 5.2 per 1,000 in 1975. (2-22)

d) Projections

Hospital Projections

2.206
Health care on the local and national levels is being provided more frequently to ambulatory patients. Whenever possible, out-patient or

Table 2-144

Distribution of Physicians by Specialty in Erie County -- 1975[1,2]

Specialty	Erie County No. MDs	 No. DOs	 Total	Erie Ratio	Ideal Ratio[3]	Ideal No.
Allergy	1	0	1	1:268,882	1: 25,000	11
Anesthesiology	7	3	10	1: 26,888	1: 14,000	19
Cardiology	7	9	7	1: 38,412	1: 25,000	11
Dermatology	6	0	6	1: 44,814	1: 40,000	7
Emergency Medicine	11	1	12	1: 22,406	N/A	N/A
Family Practice	51	31	82	1: 3,279	1: 2,000	134
Gastroenterology	2	0	2	1:134,441	1: 50,000	5
General Surgery	28	8	36	1: 7,469	1: 10,000	27
Internal Medicine	15	1	16	1: 16,805	1: 5,000	54
Nephrology	1	0	1	1:268,882	N/A	N/A
Neurology	0	0	0	-0-	1: 60,000	4
Neurosurgery	3	0	3	1: 89,627	1:100,000	3
OB/GYN	14	1	15	1: 17,925	1: 11,000	24
Ophthamology	7	3	10	1: 26,888	1: 20,000	13
Orthopedic Surgery	13	0	13	1: 20,683	1: 25,000	11
Otolaryngology (ENT)	7	0	7	1: 38,412	1: 25,000	11
Pathology	8	1	9	1: 29,876	1: 20,000	13

Table 2-144 (Continued)

Specialty	Erie County No. MDs	 No. DOs	 Total	Erie Ratio	Ideal Ratio(3)	Ideal No.
Pediatrics	8	1	9	1: 29,876	1: 10,000	27
Plastic Surgery	3	0	3	1: 89,627	1: 50,000	5
Proctology	3	2	5	1: 53,776	N/A	N/A
Psychiatry	9	0	9	1: 29,876	1: 10,000	27
Pulmonary Medicine	2	0	2	1:134,441	1:100,000	3
Physiatry	2	0	2	1:134,441	N/A	N/A
Radiology	12	4	16	1: 16,805	1: 15,000	18
Thoracic & Carido-Vascular Surgery	7	1	8	1: 33,610	1:100,000	3
Urology	9	0	9	1: 29,876	1: 30,000	9
Total	236	57	293			

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(1) Only full-time, practicing physicians listed.

(2) Based on 1975 projected population of 265,882.

(3) According to "Medical Economics" - March 19, 1973.

N/A = Not Available.

Source: Erie County Community Health Profile, April 1976.

Table 2-145

Geographic Distribution of Physicians in Erie County

Location	MDs	DOs	Total
Erie City	203	36	239
Albion	0	1	1
Corry	8	0	8
Edinboro	4	0	4
Fairview	2	1	3
Girard	1	1	2
Harborcreek	2	0	2
Lake City	1	0	1
Lawrence Park	2	6	8
Millcreek	5	9	14
Northeast	1	2	3
Wesleyville	0	1	1
West Springfield	1	0	1
Union City	6	0	6
Total	236	57	293
Percentage of Distribution			
A. Metropolitan Erie, Lawrence Park, Erie, Millcreek, Wesleyville, and Harborcreek	89.9%	91.2%	90.1%
B. Remainder of County	10.2%	8.8%	9.9%
	100.0%	100.0%	100.0%
C. Erie City	86.0%	63.2%	81.5%

Ratio of MDs to Population - 1:1,139.3
Ratio of DOs to Population - 1:4,717.2
Total Physician-to-Population Ratio - 1: 917.8

Source: Erie County Community Health Profile, Health Systems, Inc. April 1976.

Table 2-146

Dental Manpower in Erie County -- 1975(1)

Area of Practice	No.	Ratio to Population
Endodontics	1	1:268,882.0
General Practice	133	1: 2,021.7
Pediatric Dentistry	2	1:134,441.0
Periodontics	2	1:134,441.0
Oral Surgery	7	1: 38,411.7
Orthodontics	6	1: 44,813.7
Total	151	1: 1,780.7

---

(1) Based on 1975 estimated population of 268,882.

Source: Erie County Community Health Profile, Health Systems, Inc., April 1976.

Table 2-147

Geographic Distribution of Dentists in Erie County

Erie City	99
Albion	1
Corry	5
Edinboro	3
Fairview	2
Girard	8
Harborcreek	3
Lawrence Park	0
Millcreek	15
Northeast	6
Waterford	2
Wesleyville	4
Union City	2
Total	151
A. Metropolitan Erie, Lawrence Park, Erie, Millcreek, Wesleyville, and Harborcreek	80%
B. Remainder of the County	20%
Total	100%
C. Erie City	66%

Source: Erie County Community Health Profile, Health Systems, Inc., April 1976.

emergency room treatment is preferred over in-patient admission. For instance, ambulatory surgery (i.e. where a patient is admitted, operated on, and discharged in the same day) is occurring more frequently and for more types of surgery. Increasing health care costs, and pressures from third-party payers, have been the motivation for these trends, and thus assure that ambulatory treatment will continue to increase. By 1980, the current bed total of 357 in Ashtabula County will increase to 368 when construction at Brown Memorial Hospital is completed. It is anticipated that no other beds will be added through 1990 in either Ashtabula or Erie County. Based on baseline population projections for the Regional Study Area, the number of hospital beds available per 1,000 population will decrease slightly through 1990. The addition of the 11 beds in Ashtabula County will slightly increase the current ratio of 3.4 per 1,000 to 3.5 per 1,000 by 1980, and then the ratio will return to 3.4 per 1,000 in 1985 and 1990 (refer to Table 2-148). With no capacity additions planned in Erie County, the number of beds available per 1,000 population is estimated to decrease from a 1975 level of 5.8 to 5.2 by 1990. The slightly higher-than-average occupancy rates, particularly in the larger hospitals, will most likely continue through 1990. However, as noted above, increasing use of ambulatory care will reduce demand on in-patient beds and should offset the in-patient needs of a slightly larger population. For example, Ashtabula General Hospital has recently completed a new ambulatory/emergency room and Brown Memorial Hospital plans to improve its ambulatory care facilities by 1980.

Long-term Care Facility Projections

2.207
Existing nursing homes in both Ashtabula and Erie Counties currently have waiting lists for available beds. Even though long-term care facilities are available in both counties at ratios well above State averages, there is no surplus capacity. Ashtabula County currently has more than 100 beds per 1,000 population 65 years and older; and Erie County has 68 beds per 1,000 population. These Statewide averages are 65 per 1,000 and 50 per 1,000, respectively. Current plans for construction of new nursing home space will likely eliminate the existing waiting lists. Based on baseline population projections, this capacity addition will increase the number of beds available per 1,000 population 65 years and older through 1990 as shown in Table 2-149. It is therefore likely that there will be sufficient long-term care facilities to accommodate expected baseline population growth in the Regional Study Area.

Table 2-148

Projected Hospital Bed Availability in Ashtabula and Erie Counties -- 1975-1990

	1975		1980		1985		1990	
	No. of Beds	Beds Per 1000 Population	No. of Beds	Beds Per 1000 Population	No. of Beds	Beds Per 1000 Population	No. of Beds	Beds Per 1000 Population
Ashtabula County	347	3.4	368	3.5	368	3.4	368	3.4
Erie County								
Total Beds	1574	5.8	1574	5.6	1574	5.4	1574	5.2
Medical/Surgical and Pediatric Beds	1198	4.5	1198	4.3	1198	4.1	1198	4.0

Source: Arthur D. Little, Inc. estimates.

Table 2-149

Projected Long-Term-Care Bed Needs in Ashtabula and Erie Counties -- 1975 and 1990

	No. of Beds	Population Over 65 Years of Age	Beds Per 1000 Population Over 65
Ashtabula County			
1975	1126	11,118	101.3
1990	1493(1)	14,056(2)	106.2
Erie County			
1975	2001	29,343	68.0
1990	2586(1)	27,784(2)	93.1

---

(1) Assumes that beds which have been approved for construction will be built by 1990.

(2) Arthur D. Little, Inc. population projections.

Source: Health Systems Plan, Health Systems Agency of Eastern Ohio, April 1977; Erie County Community Health Profile, Health Systems Inc., April 1976.

Manpower Projections

2.208
Physicians have been actively recruited by Ashtabula General, Brown Memorial and Memorial Hospital of Geneva since 1976, and thus far the ratio of physicians per 1,000 population is growing annually. In 1975, there were 35 primary care physicians although the optimal level is 51. Future needs call for 52 physicians by 1980, 54 by 1985, and a total of 55 in the year 1990 (2-13). If active recruiting continues, the 1985 and 1990 goals can be reached and more primary care physicians would make the health care system available to a larger population. In addition, specialists are being added to hospital staffs to increase services for those already receiving health care. It is not likely that the ratio of physicians per 1,000 population in Ashtabula County will reach the Ohio Statewide average (1.48 per 1,000) by 1990, especially since it is a primarily rural community. However, given the success of the recent physician recruiting program, it is anticipated that the ratio will reach 0.90 per 1,000 by 1980, 1.00 per 1,000 by 1985, and 1.05 per 1,000 by 1990. There is no indication that similar recruiting efforts will take place in Erie County, therefore, it is anticipated that the current ratio of 1.09 physicians per 1,000 population will not increase through 1990. The ratios of dentists and nurses to population in both counties are expected to remain at current levels. There are insufficient paraprofessionals such as physical therapists, occupational therapists, physician assistance, social workers, etc., and persons with these skills will need to be recruited for both counties to provide adequate expanded health services. Based on population projections and the increased ratio of physicians to population noted above, almost 60 new doctors will be needed in Ashtabula County by 1990 (refer to Table 2-150). The county will also require a net addition of four dentists and 30 nurses. Nearly 40 additional physicians will be required in Erie County by 1990, along with 20 dentists and 175 nurses.

e) Conclusions

2.209
The health care system in Ashtabula and Erie Counties has maintained its health care delivery in keeping with national trends. Both counties have had difficulty in attracting physicians, a problem experienced in most rural and semi-rural areas in the United States. The number of hospital beds has been well planned and is utilized at capacity. Ambulatory care facilities have been constructed to meet needs through 1990. Nursing home beds have been in short supply, but this situation is expected to be corrected soon. Active recruiting is under way in Ashtabula County to meet the demand for physicians.

Table 2-150

Projected Medical Manpower Requirements in Ashtabula and Erie Counties -- 1975-1990

	1975		1980		1985		1990	
	No.	No. Per 1000 Population	No.	No. Per 1000 Population	No.	No. Per 1000 Population	No.	No. Per 1000 Population
Ashtabula County								
Physicians Primary Care(1)	35	0.35	58	0.56	66	0.62	71	0.65
Total	57	0.57	94	0.90(2)	107	1.00	115	1.05
Dentists	40	0.40	42	0.40	43	0.40	44	0.40
Nurses	360(3)	3.54	370	3.54	380	3.54	390	3.54
Erie County								
Physicians Primary Care(4)	122	0.45	130	0.45	133	0.45	136	0.45
Total	293	1.09	310	1.09	320	1.09	330	1.09
Dentists	151	0.56	160	0.56	165	0.56	170	0.56
Nurses	1425(3)	5.3	1500	5.3	1550	5.3	1600	5.3

---

(1) Primary care physician estimates are based on the assumption that the primary care share of total physicians will remain constant.

(2) The large increase in the number of physicians per 1000 population between 1975 and 1980 is the result of active recruiting programs. By 1977 this ratio had already increased to 0.84/1000.

(3) Estimate based on the ratio of nurses-to-population and 1975 estimated populations.

(4) Based on the current ratio of primary care physician-to-population.

Source: Arthur D. Little, Inc. *estimates.*

The supply of dentists and nurses is adequate, and the number of paraprofessionals is slightly below requirements.

Law Enforcement

a) Jurisdictions

Ohio Local Study Area

2.210
The Conneaut City Police Department is one of six local police forces in Ashtabula County. Jurisdiction of the department encompasses the city of Conneaut, a service area of 27.5 square miles. In addition, the Conneaut Police Department has assumed primary responsibility for patrol of the section of Interstate 90 which passes through Conneaut. (Prior to 1977, the patrol of this portion of I-90 was the principal responsibility of the Ohio Highway Patrol). Currently the Ohio Highway Patrol provides a supplementary patrol service on this part of the interstate highway. Since the city of Conneaut has its own police force, the County Sheriff provides only back-up police services to the city. Sheriff's deputies are empowered to make arrests or otherwise assist the Conneaut Police only on request. The major role of the Sheriff's Department is to provide and maintain detention facilities, since the local police department maintains only holding cells for its prisoners. By law, the Sheriff may hold prisoners in the county jail for up to one year. Longer imprisonment requires a transfer to a State facility.

Pennsylvania Local Study Area

2.211
There are no local police departments in the Pennsylvania Local Study Area, comprising Springfield Township and East Springfield Borough. The 3,200 residents of this area rely on the State Police stationed at the Girard substation for police services. The service area of this substation includes sections of Interstate 90 east of the Ohio border and Pennsylvania Routes 5, 20, 18, as well as other State roads.

Ohio Principal Study Area

2.212
In the city of Ashtabula, the Division of Police has jurisdiction over a service area of 8.39 square miles within the city limits. The North Kingsville Police Department serves the village of North Kingsville, an area of 9.5 square miles. Local police departments also operate in Andover and Jefferson. The remainder of the Principal Study Area including the coastal townships of Ashtabula,

Saybrook, and Kingsville, receive police protection and services from the County Sheriff from his central location in Jefferson.

Pennsylvania Principal Study Area

2.213
Local police departments for the Pennsylvania Principal Study Area exist only in Erie County in the following six communities: Erie City; Millcreek Township; and Fairview, Girard, Lake City, and Albion Burroughs. With the exception of the Erie and Millcreek and Girard Police Departments, all departments are smaller than the standard required to provide full 24-hour protection. (2-24) Jurisdictions of the local police departments normally include only the borough or township where the department is located. All other parts of the Principal Study Area are served by the State Police. Police jurisdiction within the Ohio and Pennsylvania Principal and Local Study Areas is illustrated in Figure 2-12 and 2-13, respectively.

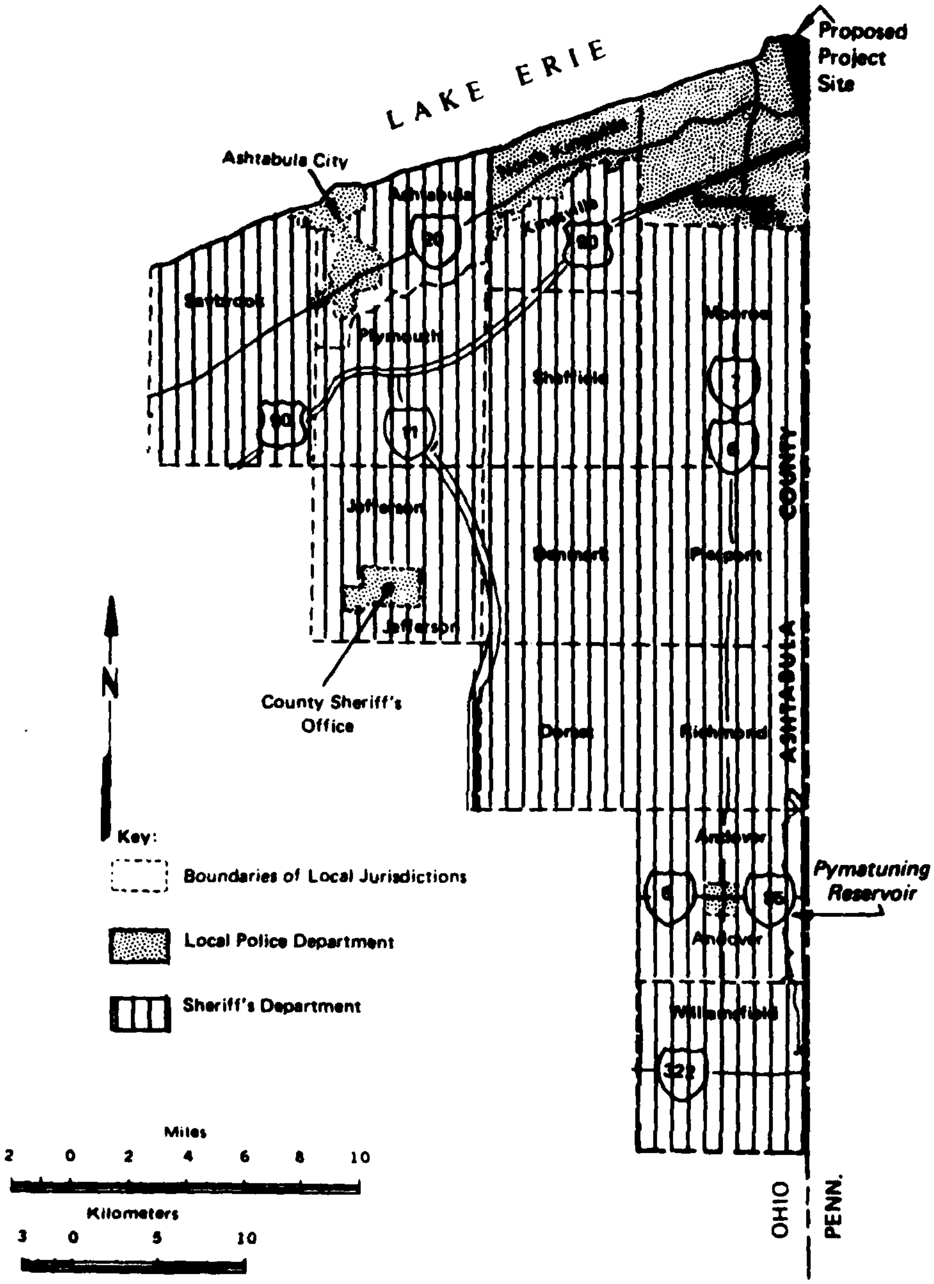
b) Organization, Administration, and Staff Employment

Ohio Local Study Area

2.214
The Conneaut Police Department is under the administration of the Chief of Police, who is responsible to the mayor of the city and the Safety-Service Director. The latter, under Section 737.02 of the Ohio Revised Code, is the executive head of the Police Department, while the Chief of Police has the responsibility for day-to-day management of police affairs. (2-25) The supervisory staff consists of two lieutenants and four sergeants. There are currently 14 patrolmen in the Conneaut Police Department, for a total of 21 full-time Police Officers. The force is backed up by 21 reserves and four civilian support personnel, including two full-time dispatchers. Table 2-151 shows the employment and salary structure of the Conneaut Police Department. The Conneaut Police Department operates on a three-shift rotation with a shift rotation with a minimum of two men per shift, six men per day. Although limited, police services are provided 24 hours a day.

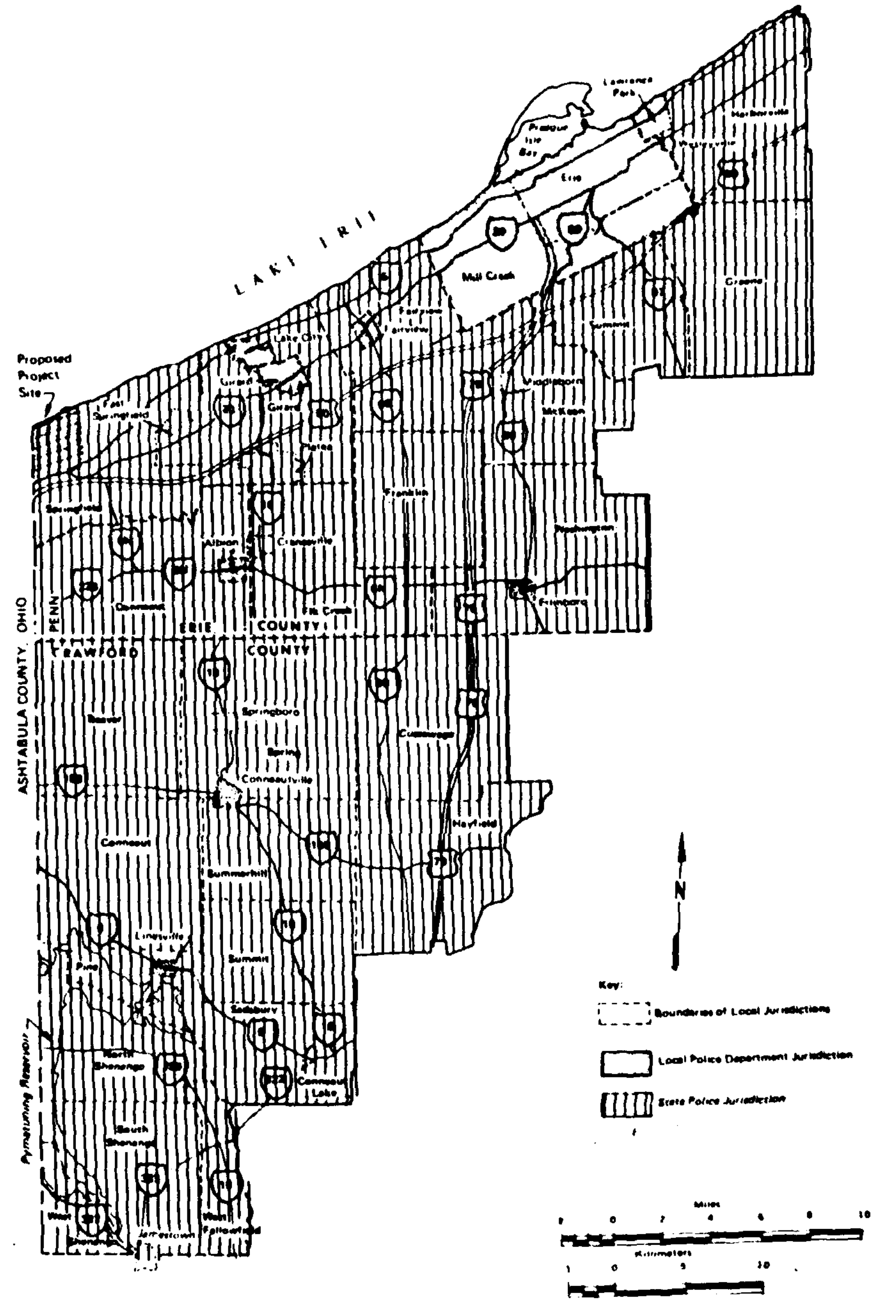
Pennsylvania Local Study Area

2.215
There are no local police departments in the Pennsylvania Local Study Area. Police services are provided under the jurisdiction of the Pennsylvania State Police Troop E. The troop headquartered in Lawrence Park, east of Erie, has substations in Girard, Corry City, and Meadville and is under the command of a captain, who is responsible to district headquarters in Harrisburg.



Source: Discussions with local police officials; Arthur D. Little, Inc. estimates.

FIGURE 2–12 POLICE DEPARTMENT JURISDICTION IN THE OHIO LOCAL AND PRINCIPAL STUDY AREAS



Source: Discussions with local police officials; Arthur D. Little, Inc. estimates.

FIGURE 2–13 POLICE DEPARTMENT JURISDICTION IN THE PENNSYLVANIA LOCAL AND PRINCIPAL STUDY AREA

Table 2-151

Conneaut Police Department Employment By Classification -- 1975

Rank	Number Employed	Average Annual Salary
Administrative		
Chief	1	$ 11,912
Lieutenant	2	10,975
Sergeant	4	10,088
Patrolmen	14	
up to 3 months' service		$ 8,810
4-12 months' service		9,110
1-2 years' service		9,422
2 years' service		9,734

Source: Conneaut City Chief of Police and Survey of Conneaut, Ohio Police Department, Center for Criminal Justice, Case Western Reserve University, January, 1976.

Table 2-152

Ashtabula County Police Department Employment(1)

	1960	1970	1975	1977
Local Study Area				
Conneaut City	7	10	18	21
Principal Study Area				
Ashtabula City	24	27	31	35
North Kingsville Village	1	1	3	4
County Sheriff's Office	N/A	19	36	50

---

(1) Uniformed and plainclothes officers only.

N/A = Not Available.

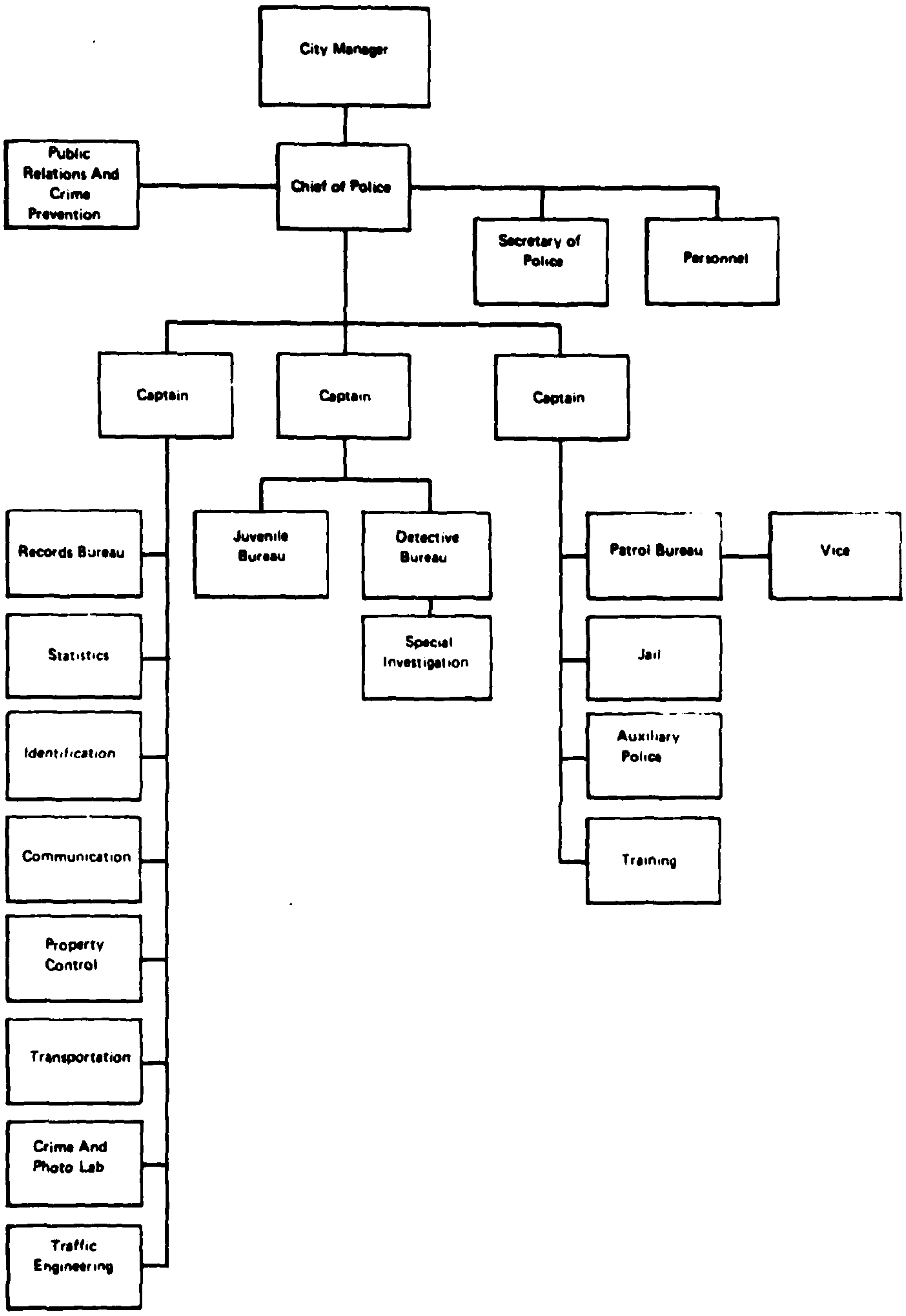
Source: Departmental reports.

Ohio Principal Study Area

2.216
The Ashtabula Police Department is the largest of the city police forces in Ashtabula County, and is organized as shown in Figure 2-14. The department is administered by a Chief of Police responsible to the City Manager. Three captains have administrative responsibilities for the department's four bureaus: records, juvenile, detective, and patrol. The total police force numbers 35 uniformed and plainclothes officers, plus five fulltime civilians. The force is supplemented by auxiliary personnel, composed of 22 members who serve on a volunteer basis. The North Kingsville Police Department has one part-time and four full-time officers. There are no support personnel. With a small force, the officers rotate on one-man, 12 hour shifts on a four-day on, four-day off basis. The Chief of Police has administrative authority for the department. County police departments employment figures for the Ohio Principal Study Area are presented in Table 2-152.

Pennsylvania Principal Study Area

2.217
The Millcreek Police Department has a total force of 51 full-time police officers and seven civilian staff. The Department is under the command of the Chief of Police, who is assisted in administrative duties by a Deputy Chief of Police. There are three divisions within the Department, each under the command of a lieutenant. No auxiliary police are used in the Millcreek Department. The Boroughs of Fairview, Girard, and Lake City all have small police departments which, combined, employ 12 full-time police officers. Each department under the command of a police chief, is supplemented by a total of seven part-time police personnel. The Girard Police Department, largest of the three, also employs five civilian personnel, including dispatchers and secretaries. The Fairview Police Department, as shown in Table 2-153 has only one full-time officer, who is also the chief. Growth (in percentage terms) of the local departments has exceeded increases in local populations. Four officers have been added each to the Girard and Lake City Police Departments since 1960. The Millcreek Police Department has been increased by 39 full-time officers since 1960, more than quadrupling employment over 1960 levels. Population during this period increased by 12 percent.



Source: *Division of Police Annual Report*, Chief Ernest Saverise, 1976.

FIGURE 2–14 ORGANIZATION OF THE ASHTABULA CITY DIVISION OF POLICE

Table 2-153

Police Department Employment and Equipment by Locality in the Pennsylvania Study Area -- 1977

	Police Officers[1]	Number of Vehicles
Girard Borough	6	2
Fairview Borough	1	2
Lake City Borough	5	2
Millcreek Township	51	19[2]
Erie City	212	69
State Police (Girard Sub-station)	25	9

---

[1] Excludes civilian and part-time personnel.

[2] Millcreek Township has one helicopter.

Source: Discussions with town officials; informal survey by Pennsylvania Department of Community Affairs Erie Regional Office; and Pennsylvania Department of Community Affairs, Bureau of Local Government Services, Division of Municipal Statistics.

c) Facilities and Equipment

Onio Local Study Area

2.218
Headquarters for the Conneaut Police Department are located in the City Hall building. Occupying two floors, the facilities include an information desk, radio room, interrogation room, squad locker room, and office space. Detention facilities include holding cells with capacity for four prisoners. Department equipment includes six cars (four marked patrol cars and two unmarked cars), all of which have radio communications with headquarters (see Table 2-154). It is department policy to keep five vehicles on patrol. To get maximum utilization of vehicles and personnel, officers patrol singly instead of in tandem.

Pennsylvania Local Study Area

2.219
The State Police substation in Girard has nine patrol cars (an increase of two vehicles over the number available in 1975, when there were three more officers than currently assigned to the station). Mobile radio communications units are provided for communication between patrol vehicles, the substation, and troop headquarters, as well as for communication with local police officials. There are no detention facilities at the substation. Jail facilities are maintained and operated by the County Sheriff Department for those areas of the county without detention quarters.

Ohio Principal Study Area

2.220
In Ashtabula City the Division of Police has 13 vehicles (see Table 2-154). These include 10 cruisers, three of which are unmarked cars, plus a dog warden truck, a community relations van, and a motorized scooter. The North Kingsville Village Police Department has two patrol cars for its four-man force. The Ashtabula City Police Department has temporary detention facilities, with a maximum capacity for 20 persons. There are no detention facilities in North Kingsville; all prisoners are transported directly to the County Jail in Jefferson. The County Sheriff is headquartered in Jefferson, near the County Court House. The facilities include office space, and there are detention facilities for up to 50 prisoners. The County Jail was ordered closed in the spring of 1977, due to inadequate facilities for housing prisoners. Current plans call for the jail to be closed in phases and prisoners transferred to facilities in other counties. New detention facilities will be constructed in Jefferson along with a proposed justice center. Vehicles at the disposal of the Sheriff include 12 patrol cars, of which three are unmarked.

Table 2-154

Inventory of Major Law Enforcement Equipment and Facilities in Ashtabula County -- 1977

	Conneaut City	North Kingsville Village	Ashtabula City	County Sheriff
Number of Stations	1	1	1	3 (1 manned full time)
Number of Vehicles	6	2	13	12
Capacity of Detention Facilities (Number of Prisoners)	4	0	20	50
Training Facilities	Columbus	London Police Academy	London Police Academy	Vocational School in Jefferson

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Source: Departmental reports.

Pennsylvania Principal Study Area

2.221
In Erie County, the police departments in the Boroughs of Fairview, Girard, and Lake City each have two vehicles. The Millcreek Police Department has 18 motor vehicles, two motorcycles, a dog law enforcement truck, a tactical van, and a helicopter. Millcreek is the only department in the county with airborne patrol capabilities. The Erie City Police Department has 69 vehicles, a mobile crime van, 14 motorcycles, a dog law enforcement van, and a prisoner van. There are four jails maintained by police departments in Erie County and one in Crawford County. The five police departments which maintain these facilities include Linesville Borough, Erie City, Albion Borough, Girard Borough, and Millcreek Township. (Data on the capacity of the facilities were not available.) The capacity of the jails maintained by the County Sheriff is estimated to be 170 for Erie County and about 100 for Crawford County. All departments have radio communication capability. Most departments maintain their own radio bases, although four departments, including the Lake City Police Department, belong to a network.

d) Budgets

Ohio Local Study Area

2.222
In 1975, expenditures of the Conneaut Police Department amounted to $288,193 as shown in Table 2-155. The total payroll for the Police Department was $211,011 with 80 percent ($171,011) financed from the General Fund, and 20 percent ($40,000) from Federal revenue sharing. Overall, almost 80 percent of the department's 1975 budget was spent for salaries and benefits. Other major expenditures included equipment, furniture and fixtures, maintenance and repair, fuel for vehicles, and uniform allowances.

Pennsylvania Local Study Area

2.223
Budgeted expenditures for the Pennsylvania Local Study Area are derived from State sources, since the allocations for State police are made in the State budget. A detailed budget breakdown for the Girard substation is not available at this time.

Ohio Principal Study Area

2.224
Revenues for police department expenditures in Ashtabula City are obtained from a combination of local and Federal sources. Total expenditures for the Ashtabula City Police Department were $583,000 in

Table 2-155

Conneaut Police Department Municipal Expenditures -- 1975

Item	Expenditures
Salaries[1]	$ 211,011
Benefits[2]	18,084
Vehicle Maintenance[3]	25,713
Equipment, Furniture, Fixtures	14,083
Uniforms	6,245
Auxiliary Police	3,107
Prisoner Sustenance and Medical Care	1,364
Officer Training	1,880
Other	6,706
Total	$ 288,193

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[1] Total includes $40,000 for payroll from revenue sharing.

[2] Includes employee medical care and accrued police pension fund liability.

[3] Includes repairs, maintenance, parts, gas, oil, grease, and fleet insurance.

Source: City of Conneaut Financial Statement, 1976.

1975. Of the expenditures, almost 90 percent is for wages, salaries, and benefits, including all pension payments. (2-26) Total expenditures for police services in North Kingsville Village were $32,000 in 1975, when the Police Department consisted of three officers. In 1977, the budget for police expenditures was raised by 55 percent due to the replacement of a police vehicle and the addition of one full-time and one part-time officer. For the County Sheriff, total expenditures under the 1975 budget were $552,000, principally for wages, salaries and benefits for deputies and ranking officers, and for operation and maintenance of patrol vehicles. While the number of deputies has increased since 1975, expenditures in 1977 have been budgeted at 61,000 which represents a decline of over 15 percent from 1975 levels.

Pennsylvania Principal Study Area

2.225
From 1970 to 1975, total expenditures for operations and maintenance by local and county police departments in Erie and Crawford Counties increased at an average rate of about 12 percent per year. In 1975, total expenditures were $4.6 million. The Erie City Police Department, with expenditures of about $3.1 million, accounted for more than two-thirds of the total expenditures for police services in the two counties. The Millcreek Police Department, with expenditures of $999,471, and the Girard Police Department, with expenditures of $110,182, ranked second and third, respectively. Expenditures by all local and county police departments in Crawford County totaled $46,565, accounting for only 10 percent of the expenditures for the two counties combined.

e) Projections

Personnel

Ohio Local Study Area

2.226
To maintain current levels of police protection in the Ohio Local Study Area, in terms of police personnel per 1,000 population, the Conneaut Police Department would be required to add only one additional full-time staff person by 1990. This estimate is based on the modest population growth projected for the city of Conneaut over the next 13 years. As noted previously in Table 2-151, the Conneaut Police Department is operating presently at the authorized strength of 21 full-time officers.

2.227
In addition, there are two full-time civilian clerk dispatchers. To bring the Conneaut Police Department up to the national average for

police personnel per 1,000 population in its population range, nine additional personnel would be required through 1990. Since all other communities in Ashtabula County are presently below national standards for police personnel, and since the necessary budgetary increases would be quite significant for Conneaut and would likely require an increase in local tax rates, and thus, voter approval, it has been assumed that such an increase in the number of police personnel is highly unlikely. Based upon discussions with local police officials in Conneaut, a best estimate of three additional police personnel has been assumed by 1990 as shown in Table 2-156.

Pennsylvania Local Study Area

2.228
The present population in Springfield Township and the Borough of East Springfield is of a size sufficient to support a local police department rather than continuing the protection presently provided by the State Police. Further, the projected population growth in the Pennsylvania Local Study Area, though low, will likely result in increasing demands for police services through 1990. This demand could be met and police services provided by various methods. First, the existing State Police staff of the Girard substation could be increased, along with the number of patrols assigned. These changes could be supplemented with the establishment of a communications base, perhaps utilizing the citizen's band radio as is now the case in McKean Borough. Second, additional police services could be contracted from neighboring municipalities, as is now practiced by Sadsbury Township in Crawford County. A third alternative would be the establishment of a local police department which would serve both Springfield Township and East Springfield Borough. Such a department could be structured as a full-time department, a combination full- and part-time department, or as is the case in at least one department in the two-county area, a fully part-time department. On the basis of a national average of 1.6 full-time police personnel per 1,000 population (based on population of less than 10,000) two full-time equivalent personnel would now be required to meet the standard for police protection. By 1990, approximately three full-time police personnel would be required. However, in 1975, the actual level of police protection provided in Erie and Crawford Counties averaged about 1.0 law enforcement personnel per 1,000 population. At this level, three full-time personnel would be required in the Pennsylvania Local Study Area and four required in 1990. Estimates of future police personnel levels for the Local Study Area are based on this lower level of law enforcement personnel per 1,000 population.

Table 2-156

Projected Police Personnel Needs in the Ohio Study Area(1)

Study Area Police Departments	Police Personnel 1977	1980	1990	Police Personnel Per 1000 Population 1977	1980	1990
Conneaut	23	24	26	1.5	1.6	1.6
North Kingsville Village	4	5	7	1.5	1.7	1.8
Ashtabula City	40	41	41	1.7	1.8	1.9
County Sheriff	57	61	65	1.3	1.3	1.3

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(1) Includes civilian personnel.

Source: Local police officials and Arthur D. Little, Inc. estimates.

Table 2-157

Projected Police Personnel Needs in the Pennsylvania Principal Study Area(1)

Study Area Police Department	Police Personnel 1977	1980	1990	Police Personnel Per 1000 Population 1977	1980	1990
Girard Borough	6	6	6	2.3	2.1	1.8
Fairview Borough	1	2	4	0.5	0.9	1.2
Lake City Borough	5	5	5	2.1	2.0	1.7
Millcreek Township	58	62	73	1.4	1.5	1.6
State Police (Girard Sub-station)(2)	27	33	42	1.4	1.4	1.4

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(1) Includes civilian personnel.

(2) The State Police are directly responsible for unincorporated areas and incorporated areas lacking local police services.

Source: Local police officials and Arthur D. Little, Inc. estimates.

Ohio Principal Study Area

2.229
Only very modest growth is projected for those Coastal Communities which maintain police departments. The North Kingsville Police Department, which currently consists of four full-time personnel, has determined its local need to be two additional officers and a dispatcher by 1990. The Ashtabula City Police Department projects maximum growth for the Department over the next 13 years to require the addition of three more officers. However, with population expected to decline, it is estimated that only a single full-time staff person need be added to maintain current levels of service. The burden of growth within the county, in terms of police services, will be assumed largely by the County Sheriff Department. To maintain current county-wide levels of police protection, it is estimated that four additional personnel will need to be added by 1980 and four more by 1990 (refer to Table 2-156).

Pennsylvania Principal Study Area

2.230
Although population in the Pennsylvania Principal Study Area is generally projected to increase, there may be further contraction in the Erie City Police Department which could offset, in some measure, the growth in smaller departments in the rest of the county. From 1975 to 1977, the Erie Police Department lost five full-time officers while other departments gained 17 full-time officers. No growth in police personnel is expected in Girard and Lake City, while the Fairview Police Department may add three additional officers, by 1990. In Millcreek, where population is expected to increase by about 14 percent, it is estimated that 15 additional officers will be required (refer to Table 2-157).

Expenditures

2.231
For the Coastal Communities of the Principal Study Area, per capita expenditures for police services ranged from $12 to $26 in 1975 (excluding Girard Borough which averaged $42 per capita due to the establishment of a new communications center in 1975). In projecting associated operating costs for law enforcement, a range of $22.50 to $25.00 per capita was assumed for most communities. Both North Kingsville Village and Fairview Borough spent about $12 per capita for law enforcement in 1975, which, except for Albion Borough, was well below the levels in other communities. It was assumed that both of these communities would continue to spend well below the per capita levels in other localities. Accordingly, it was estimated that they would spend $18.00 per capita in 1980 and $20.00 per capita

by 1990, compared with a range of $22.50 to $25.00 for other communities during this period. As the number of police personnel per 1,000 population changes, the operating cost per individual policeman also changes. For example, in Millcreek in 1977 the operating cost per police personnel is estimated at $18,000 ($25.50 per capita divided by 1.4 police personnel per 1,000 population) and is assumed to decline to $16,000 ($25.50 divided by 1.6 police personnel per 1,000 population) in 1990. Although more police are employed, the cost associated per personnel decreases since the fixed cost of operating a police department (e.g. lighting, supplies, equipment, etc.) is now spread across more personnel. All projections reflect operating expenditures and do not account for capital outlays such as the construction of a new police station.

Ohio Local Study Area

2.232
Based on projected growth in the Conneaut Police Department, expenditures for police protection are expected to rise to $348,000 in 1980 and $403,000 by 1990, expressed in constant 1975 dollars. These estimates are based upon an assumed ratio of 1.6 police personnel per 1,000 population and on operating cost of police personnel per 1,000 population of $23.50 in 1980 and $25.00 in 1990.

Pennsylvania Local Study Area

2.233
Assuming that Springfield Township establishes a local police department employing two full-time personnel by 1980, its estimated budget expenditures for police services would be similar to Fairview Borough, roughly $35,000. Without the establishment of a local police department, the cost of providing law enforcement will continue to be reflected in the budget of the State Police.

Ohio Principal Study Area

2.234
Based on projected growth levels in the local police departments in the Ohio Coastal Communities, growth in expenditures for these departments is generally expected to be modest, particularly in Ashtabula City where it is assumed to be constant. The Ashtabula Police Department is expected to fill its present vacancy raising the size of its force to 41, its authorized size is expected to maintain current expenditures to enhance the efficiency of the force while striving to provide and maintain a modern police force. (2-27) With the North Kingsville Police Department expected to nearly double the number of police personnel by 1990, expenditures are expected to increase more than two-fold, to about $100,000 (in 1975 dollars) (refer to Table 2-158).

Table 2-158

Projected Expenditures for Police Service in Key Coastal Communities of the Ohio Principal Study Area
(Thousands of 1975 Dollars)

Department	1975	Projected 1980	Projected 1990
Conneaut	$250,000	$348,000	$403,000
North Kingsville Village	32,000	55,000	80,000
Ashtabula City	583,000	583,000	583,000

Table 2-159

Projected Expenditures for Police Service in Key Coastal Communities of the Pennsylvania Principal Study Area
(Thousands of 1975 Dollars)

Department	1975	Projected 1980	Projected 1990
Fairview Borough	$ 24,000	$ 40,000	$ 65,000
Girard Borough	110,000	72,000	84,000
Lake City Borough	53,000	60,000	75,000
Millcreek Township	999,000	1,054,000	1,168,000

Pennsylvania Principal Study Area

2.235
Expenditures for police services in the Pennsylvania Principal Study Area are projected to increase across a broad range. In order to meet the payroll projected by 1990, the Millcreek Police Department will be required to increase expenditures by about one percent per year, while the Fairview Police Department will increase expenditures by more than 15 percent per year. With the installation of a new communication system, expenditures in Girard peaked in 1975 and have now returned to more normal levels and are expected to hold steady or increase only slightly during the projection period since no additional personnel will be required (refer to Table 2-159).

Fire Protection

a) Department Organization and Personnel

Ohio Local Study Area

2.236
The Conneaut Fire Department serves the entire city area of about 27.5 square miles and is composed of both paid and volunteer staff. There are 13 full-time firefighters (a number which has held constant since 1960), 10 part-time firefighters, and 60 volunteers (see Table 2-160). The department is under the administration of the Fire Chief, who is assisted by two battalion chiefs, a captain, and three lieutenants. Growth in manpower in the department has principally been in part-time employment and volunteer firefighters. The number of volunteers has increased by 20 since 1970, and totalled 60 firefighters in 1975. During 1975, the Conneaut Department responded to a total of 383 calls. Of these, 72 were structural fires while the rest were auto fires, rescue calls, and other emergencies. The Conneaut Fire Department estimated the dollar value of fire-related damages in 1975 to be in excess of $213,000. Although the total number of calls has fluctuated during the past 14 years between a low of 367 (1970) and a high of 398 (1963), the dollar value of total damages has increased more than sixfold during the same period. During this time, the number of structural fires has increased only moderately, from 78 fires in 1963 to 83 in 1976. Based on the number of calls to which the department has responded, the additions to part-time and volunteer staff have enhanced the firefighting capabilities of the Conneaut Fire Department.

Pennsylvania Local Study Area

2.237
The Springfield Volunteer Fire Department (SVFD) is organized as a wholly volunteer company. The SVFD provides protection to

Table 2-160

Fire Department Personnel in the Ohio Coastal Communities

	1970			1975		
	Full-Time	Part-Time	Volunteer	Full-Time	Part-Time	Volunteer
Local Study Area						
Conneaut	13	6	40	13	10	60
Principal Study Area(1)						
Ashtabula City	39	-	-	40	-	-
Ashtabula Township(2)	-	-	-	3	35[3]	-
North Kingsville Village	-	3	31	-	-	30
Saybrook Township	3	-	50	3	8	40

---

(1) Comparable data for Kingsville Township was not available.

(2) Ashtabula Township established a fire department in 1973.

(3) Paid hourly on a per-call basis.

Source: Departmental reports and discussions with department officials.

Springfield Township and East Springfield Borough, which comprise the local study area. The level of manpower in the SVFD remained constant at 40 volunteers between 1960 and 1975. The department is presently manned by 45 individuals, an increase of five since 1975. Members of the department are trained in both firefighting and emergency rescue techniques. In calendar year 1976, the SVFD responded to 75 fire-related calls, and 150 calls requiring an emergency ambulance. Estimates on the extent of damages as a result of fire were not available.

Ohio Principal Study Area

2.238
Combined, the strength of fire departments in the Coastal Communities is estimated at 59 full-time, 53 part-time, and over 130 volunteer firefighters. The Ashtabula City Fire Department with a total of 40 full-time firefighters is the largest in the county and also the only department not supplemented by volunteer staff (refer to Table 2-160).

Pennsylvania Principal Study Area

2.239
Of the 40 municipalities in the Pennsylvania Principal Study Area. Erie City, all 14 boroughs, and nine of the 25 townships have at least one fire station located within their limits. Fourteen other townships have no fire company within their boundaries but are served by fire companies in neighboring municipalities. All of the Coastal Communities have a volunteer fire department. Fairview Borough Township is served by both the Fairview Fire Company and the Lakeshore Volunteer Fire Department. The borough of Girard is serviced by the Dobler Hose and Ladder Company, while the township receives additional services from the Lake City Fire Company and Platea Volunteer Fire Company. Both the Lake City and Platea boroughs maintain volunteer fire companies. There are five volunteer companies for Millcreek Township. The companies include the Belle Valley Hose Company, the Kearsarge Fire Department, the Lake Shore VFD, the West Lake Fire Department, and the West Ridge Hose Company. The total number of active firemen for these companies is not known.

b) Facilities and Equipment

Ohio Local Study Area

2.240
The Conneaut Fire Department has three branches or substations, in addition to the main station. Two of the four stations are manned by full-time personnel, while two are manned solely by volunteers.

Department equipment includes seven pumpers, a 65-foot aerial ladder, and three chief cars. An inventory of major pieces of equipment is presented in Table 2-161.

Pennsylvania Local Study Area

2.241
There is one fire station in the Pennsylvania Local Study Area, located in Springfield Township. Equipment for the department includes one 750-GPM pumper, one 1,000-gallon tanker, one ambulance, and a grass fire jeep. None of the vehicles is older than 10 years. Equipment for the SVFD and other departments is listed in Table 2-162.

Ohio Principal Study Area

2.242
The Ashtabula City Fire Department, with two stations, has five firefighting pieces, three of which are more than 10 years old. The Ashtabula Township Department has 10 major pieces of firefighting and rescue equipment for its fire station. The North Kingsville Department has five pieces of equipment, while the Saybrook Department has seven pieces. Equipment for these departments is listed in Table 2-163.

Pennsylvania Principal Study Area

2.243
There are 58 pieces of equipment in the 10 companies of the Pennsylvania Coastal Communities, as shown in Table 2-162. With 32 pieces between them, the five companies of Millcreek Township account for almost 60 percent of all area equipment.

c) Budgets

Ohio Local Study Area

2.244
Expenditures by the Conneaut Fire Department in 1976 totalled about $240,000 (versus $220,000 in 1975), with wages and salaries accounting for about 70 percent of the total. Expenditures have nearly doubled since 1970, due principally to the addition of major equipment, including two pumpers, an aerial ladder, two ambulances, a rescue van, and a chief's car. In addition, the higher costs of fuel and personnel salaries have contributed to rising expenditures for fire protection. Expenditures for fire protection are financed primarily from local sources. However, in recent years, Federal revenue-sharing funds have been used to defray the costs of salaries, and to finance purchases of major equipment (see Table 2-164).

Table 2-161

Conneaut Fire Department Equipment Distribution by Sub-station -- 1976

Station Number	Fire Apparatus No.	Fire Apparatus Type	Fire Apparatus Capacity	Other No.	Other Type	Total Vehicles
1	1	Pumper	750 GPM	1	Chief Car	2
2	1	Pumper	750 GPM			2
	1	Pumper	1000 GPM			
3	1	Pumper	1000 GPM	3	Ambulances	7
	1	Tank Truck	600 GPM	1	Chief Car	
	1	Grass Fire Jeep				
4	1	Pumper	750 GPM	1	Chief Car	5
	1	Pumper	1000 GPM			
	1	Grass Fire Truck	200 gal.			
	1	Aerial Ladder	65 feet	—		--
	10			6		16

Source: Conneaut Fire Department.

Table 2-162

Fire Equipment Inventory in the Pennsylvania Coastal Communities -- 1975

Name of Fire Company	Total Number of Vehicles	Types of Vehicles			
		Pumpers	Tankers	Ambulances and Rescue	Other
Local Study Area					
Springfield VFD	4	1	1	1	1
Principal Study Area					
Fairview VFD	4	2	1	-	1
Girard VFD	7	3	1	1	2
Millcreek					
Belle Valley Hose	7	3	1	1	2
Kearsarge FD	5	3	1	-	1
Lake Shore VFD	6	1	1	1	3
West Lake FD	7	2	1	2	2
West Ridge Hose	7	2	1	2	2
Platea VFC	6	2	-	2	2
Lake City FC	5	3	-	-	2
Total	58	22	8	10	18

Source: Departmental reports.

Table 2-163

Fire Equipment Inventory in the Ohio Coastal Communities -- 1975

Department	Total Number of Vehicles	Types of Vehicles				
		Pumpers	Ladders	Trucks	Ambulance and Rescue	Other
Local Study Area						
Conneaut	17	7	1	2	4	3
Principal Study Area						
Ashtabula City	8	4	1	-	-	3
Ashtabula Township	10	2	-	1	4	3
North Kingsville Village	5	3	-	-	2	-
Saybrook	7	4	-	2	1	-
Total	47	20	2	5	11	9

Source: Departmental reports.

Table 2-164

Municipal Expenditures for Fire Departments in the Ohio Coastal Communities -- 1975

	Expenditure	Per Capita
Local Study Area		
Conneaut	$220,000	$15.0
Principal Study Area		
Ashtabula City	531,000	21.8
Ashtabula Township	196,000	28.0
Saybrook Township	79,000	11.3
North Kingsville Village	18,000	7.2

Source: Financial Report for Ohio Cities, Townships and Boroughs, Thomas F. Ferguson, Auditor of State, 1975; Arthur D. Little, Inc. estimates

Table 2-165

Municipal Expenditures for Fire Departments in the Pennsylvania Coastal Communities -- 1975

	Expenditure(1)	Per Capita
Local Study Area		
Springfield	1975 = $ 2,000	$0.8
East Springfield Borough	1976 = 7,000	2.2
Principal Study Area		
Fairview Borough	200	0.1
Girard Borough	$ 8,000	3.1
Millcreek Township	17,000	0.4

---

(1) Fairview Borough and Springfield hold annual raffles and/or carnivals to raise monies for their volunteer fire departments. As a result, they have unusually low per capita costs. Others, such as Girard Borough and Millcreek Township, ask for donations to raise funds. All such funds have been excluded from these data.

Source: Annual Audit and Financial Report for Pennsylvania Cities, Townships and Boroughs (Erie County), Pennsylvania Department of Community Affairs, 1975; and Arthur D. Little, Inc. estimates.

Pennsylvania Local Study Area

2.245
Total expenditures for the SVFD were estimated by the department at $60,000 in 1976, the bulk of which went for the purchase of new equipment. In 1976, a total of approximately $7,000 (vs. only $2,000 in 1975) was contributed by the Government of Springfield Township and East Springfield Borough. The bulk ($53,000) of 1976 revenue was derived from donations and an annual carnival held in July. This arrangement, according to local sources, is adequate for the present needs of the department. Contributions from Springfield Township and Borough are determined by negotiation (refer to Table 2-165).

Ohio Principal Study Area

2.246
Total expenditures by the Ashtabula City Fire Department, with the largest full-time force, were approximately $531,000 in 1975. By contrast, the Ashtabula Township Department, with a smaller full-time staff, but more equipment, had estimated expenditures of $196,000. Total expenditures for the Saybrook Department were $79,000, while North Kingsville spent only $18,000 for fire protection.

Pennsylvania Principal Study Area

2.247
The volunteer departments of the Pennsylvania Principal Study Area, as in Springfield, rely on budget allocations from local Governments for only a portion of revenues. The bulk of operating funds available to these departments are generated through local fund-raising activities organized by the firemen themselves. In contrast to the paid departments, where wages and salaries are the most significant expenditures, the purchase and maintenance of firefighting equipment constitute the bulk of expenditures for the volunteer departments.

d) Projections

Personnel

Ohio Local Study Area

2.248
The Conneaut City Department may construct another station to provide more comprehensive protection. Even without the new station, there may be a need for additional full-time staff to reduce the present dependence on volunteer firefighters. Six additional firefighters and an estimated 20 volunteers may be required to provide protection

for projected 1990 population (2-28). Projections for fire department personnel in the Ohio Local Study Area are shown in Table 2-166.

Pennsylvania Local Study Area

2.249
Increased population will require additional equipment and volunteers to man the equipment. Through 1980, an additional five to ten volunteer firefighters and two to three pieces of equipment may be required to maintain the present level of protection. In addition, regular equipment replacement will be necessary to maintain the efficiency of the department.

Ohio Principal Study Area

2.250
With populations increasing at a slow rate, only moderate growth will be required in the departments of the Ohio Principal Study Area. The Ashtabula Township and Saybrook Departments have both indicated the need for additional equipment and facilities, as well as for additional personnel, however, both Ashtabula City and North Kingsville Village have indicated that there are no planned additions to existing staff or facilities in the near term. Longer-range projections indicate the need for regular replacement of aging equipment. Through mutual aid and the transition from volunteer to part- or full-time paid staff, most of the requirements for growth in the county can be met (see Table 2-166).

Pennsylvania Principal Study Area

2.251
The number of calls for firefighting services to the Fairview and Girard Districts has been declining in recent years. Should this trend continue, increases in the size of departments may not be necessary, except insofar as required to keep pace with growth in population. At the same time, mutual aid agreements with departments in neighboring municipalities contribute to the resources available to the departments and will likely forestall the necessity for adding additional personnel to most of the area's departments. However, aging equipment will need to be replaced.

Expenditures

2.252
Projected municipal costs for coastal community fire departments are presented in Table 2-167.

Table 2-166

Projections for Fire Department Personnel in the Ohio Coastal Communities

	1977			1980			1990		
	Full-Time	Part-Time	Volunteer	Full-Time	Part-Time	Volunteer	Full-Time	Part-Time	Volunteer
Local Study Area									
Conneaut	13	10	60	13	10	60	19	10	80
Principal Study Area									
Ashtabula City	40	–	–	40	–	–	40	–	–
Ashtabula Township	3	35	–	5	40	–	7	45	–
North Kingsville Village	–	–	30	–	–	30	–	–	30
Saybrook Township	3	8	40	3	10	40	5	10	50

Source: Conneaut Fire Department Officials; Arthur D. Little, Inc. estimates.

Table 2-167

Projected Municipal Costs for Coastal Community Fire Departments

	Expenditures (1975 Dollars)		
Ohio	**1975**	**1980**	**1990**
Local Study Area			
Conneaut	$220,000	$270,000	$320,000
Principal Study Area			
Ashtabula City	531,000	531,000	531,000
Ashtabula Township	196,000	230,000	270,000
North Kingsville Village	18,000	22,000	28,000
Saybrook Township	79,000	85,000	115,000
Pennsylvania			
Local Study Area			
Springfield	7,000(1)	8,000	9,000
East Springfield Borough			
Principal Study Area			
Girard Borough	8,000	10,000	12,000
Fairview Borough	200	1,000	3,000
Millcreek Township	17,000	18,000	20,000

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(1) Data are for 1976.

Source: Arthur D. Little, Inc. estimates.

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FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY UNIT--ETC(U)
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Ohio Local Study Area

2.253
Based on the planned addition of six full-time and 20 volunteer personnel to the existing Conneaut Fire Department by 1990, total municipal costs are expected to be about $320,000 (in 1975 dollars). This estimate assumes that per capita costs will rise from $15 in 1975 to $20 by 1990, reflecting additional personnel expenditures, such as wages and salaries, and increases in supplies and equipment maintenance costs associated with the addition of required fire-fighting apparatus.

Pennsylvania Local Study Area

2.254
Municipal contributions in the Springfield area to operating revenues for the volunteer fire department are expected to remain about $2 per capita, based on 1976 average spending levels (see Table 2-165). In the past, local fund-raising efforts have provided the bulk of the revenues for the SVFD. As the number of volunteer personnel and demand for more comprehensive fire protection services increase, the municipalities may have to assume a much larger part of the financial needs of the department. Even so, expenditures by the local Governments of the Local Study Area will be among the lowest in the Regional Study Area.

Ohio Principal Study Area

2.255
In Ashtabula City, where no growth is projected for fire department personnel, expenditures are assumed to remain constant in real terms. Only nominal growth in expenditures is expected for North Kingsville Village, which maintains a volunteer fire department, largely for operation and maintenance costs. Ashtabula Township and Saybrook Township should experience more substantial, but still moderate growth in expenditures. Per capita costs for Ashtabula Township and Saybrook Township are assumed to increase by 1990 by about 15 percent from 1975 spending levels (see Table 2-164), largely to account for the additional full- and part-time personnel.

Pennsylvania Principal Study Area

2.256
It is assumed that all departments in the Pennsylvania Principal Study Area will maintain volunteer status. Accordingly, nominal growth in expenditures is expected. Per capita expenditures, while expected to increase modestly, will remain substantially below average expenditures in Ohio. As in Springfield, local Governments

may have to assume greater proportions of the cost of fire protection services as the size and requirements increase overtime.

Recreation

Ohio

2.257
An inventory of the existing public and private recreational facilities in Ashtabula County is presented in Table 2-168. The locations of these recreational facilities are shown in Figure 2-15. Major recreational activities in Ashtabula County include fishing, hunting, boating, hiking, swimming, camping, and picnicking. The county draws sportsmen from throughout Ohio and Pennsylvania who find nearly 20 species of game fish, white tailed deer, ruffed grouse, woodcock, cottontail rabbits, quail, pheasant, and other game animals. In the period 1 July 1975-30 June 1976 boat and shore anglers spent approximately 200,000 hours in Ashtabula County fishing for yellow perch, walleye, white bass, freshwater drum, channel catfish, smallmouth bass, and other Lake Erie fish species. This is a small percentage (about seven percent) of the total 2.5 million annual Ohio Lake Erie angling hours and may indicate limited Ashtabula County lake fishing access.

a) Ohio Local Study Area

Existing Facilities

2.258
Conneaut City and Township are prime outdoor recreational areas which support a wide variety of activities, such as boating, fishing, hunting, swimming, golf, picnicking, camping, and organized sports such as baseball/softball. The primary outlets for water-related sports are Lake Erie, Conneaut Creek, and Turkey Creek. Other activities are supported by three major public parks: Conneaut Township Park, Lakeview Park, and Farnham Park; Evergreen Lake Park (a private campground open to the public); a public 18-hole golf course (Conneaut Shores) and private recreational clubs. There are three public boat launching ramps in Conneaut, one in Conneaut Township Park, and two at the Conneaut Public Dock. The public dock has two small boat hoists and space to moor approximately 300 boats nearby. In addition, the privately-owned Snug Harbor Marina covers 750-1,000 feet of the waterfront and provides over 30 moorings which can be rented by the public on a seasonal basis. The marina has a 100-foot fuel dock and a hoist for small boat launching. There are two private clubs with launching facilities and mooring areas: the Conneaut Boat Club and the Lake Erie Boating Club. The latter has two hoists

Table 2-168

Ashtabula County Recreational Facilities

Ownership Status(1)	Facility & Location	Total Area (Acres, unless Otherwise Shown)	Fish & Wildlife Areas				Boating Areas		Beach Swimming (Linear Ft)	Pool Swimming (Sq Ft)	Hunting (Game Waterfowl) (Acres)	Shooting (Trap Skeet) (Acres)	Hiking Trails (Miles)	Camping			Picnicking		Golf	[illegible]
			Ac	Shore Ft.	Stream Miles	A.	No. Mrngs	Launch Ramps						Sites	Cabins	Acres	No. Tables	Acres	Holes	
	Conneaut																			
PR	Ambuy Rod & Gun Club	80									[illegible]	[illegible]								
PR	Camp Peet	100																		
PR	Conneaut Boat Club						8													
PR	Conneaut Fish & Game Club	91	1	1300							5	1	•	2			[illegible]	[illegible]		
PB	Conneaut Public Dock			x			80	•												
PR	Conneaut Shores																		[illegible]	
PB	Conneaut Township Park	47.5		1760				•	x								[illegible]			
PB	Evergreen Lake Park	25		x					x					x			x			
PB	Farnham Park	82															50			
PR	Lake Erie Boating Club	1	1					1												
PB	Lakeview Park	4															•			
PB	MDW Launching Ramp							•												
PR	Snug Harbor Marina	1000 ft					10	•												
PB	Stream Easement Conn. Creek		11,668																	
	Conneaut Creek	24 mi																		
	Turkey Creek	1.5 mi			[illegible]															
	Lake Erie			•		x			x											
	Kingsville																			
PB	Buck Lake-N.E	5	5																	
PR	Camp Luther-N.E	15							x					•						
PR	Camp Calvary-N.E	10												•						
PR	Kings Lake	5							x					[illegible]						
PR	Locust Lake Kampgrounds	53		2000												•	•	•		
S	State Rest Area	•																		
PR	Village Green Golf Course-N.E	150																	•	
PB	Village Green Park-N.E	300		x		x			x					•						
	Saybrook																			
PR	Ashtabula Country Club									x										
PR	Ashtabula Rod & Gun Club	60	2									•					•		•	
PR	Chapel Hills Golf Club	102																	•	
PR	Maple Ridge Golf Course	149																	•	
PR	Redbrook Boat Club	6					50	2												
PB	Saybrook Township Park	8	450						x	[illegible]							•			
PR	Twin Oaks Par 3																		•	[illegible]
	Ashtabula																			
PR	Ashtabula Yacht Club						40													
PR	Brockway Marine						25													
PB	Brooker Field	2																		
PR	Hide-A-Way Campground			x						x				•			•			
PB	Indian Trails Park	400		x										•			•			
PB	--Cederquist Park	20																		
PR	Jack's Auto Marine			x																
PB	Lake Shore Park	50						2									•			
PB	Massucci Park	5																		
PB	North Park	2																		
PR	Riverside Yacht Club						10													
PB	Smith Field	5	x																	
PB	South Park	1																		
PR	Sutherland Marine						x													
PB	Walnut Beach Park	18							x	x										

Table 2-168 (Continued)

Ownership Status(1)	Facility & Location	Total Area (Acres, unless Otherwise Shown)	Fishing Areas Ac	Fishing Areas Shore Ft	Stream Miles	Boating Areas Ac	Boating Areas No. Moorgs	Boating Areas Lnch. Ramps(2)	Beach Swimming (Linear Ft)	Pool Swimming (Sq Ft)	Hunting (Game, Waterfowl) (Acres)	Shooting (Trap Skeet) (Acres)	Hiking Trails (Miles)	Camping Sites	Camping Cabins	Camping Acres	Picnicking No. Tables	Picnicking Acres	Golf (Holes)	No. Ballfields
	Andover																			
PB	[illegible] Lakes Campground	135	35											1			5			
S	Pymatuning State Park	8400	3500			3500	500	5	1,000		X			645	62		[illegible]	500		
PR	Pymatuning Valley Golf	88																	9	
PR	Westhaven Lakes	100	17	3000												4	[illegible]	25		
PR	Village Hill Stables	76									125			30						
	Jefferson																			
PR	Buccaneer Campsites	40	8		X	X			X					150			8		18	
	Monroe																			
PB	Conneaut Country Club	150															[illegible]	[illegible]		
	Williamsfield																			
PR	Pymatuning Ranch	25																		
	Geneva																			
S	Geneva-on-the-Lake	88		21,300						[illegible]	865									
	Harpersfield																			
S	Grand River	36 mi		X																
	New Lyme																			
S	N.L. Wildlife Area	530									530									
	Orwell																			
S	Orwell Wildlife Area	197	X			X					197									

[1] Five miles available for hunting of waterfowl and small game

(1) Key to government ownership: PB = Public (township or village), PR = Private, S = State

(2) Includes hoists and winches

(3) X = Activity known to take place, specific numbers not available

Source: Pennsylvania Office of State Planning and Development; Ohio DNR; Arthur D. Little, Inc. estimates (based on interviews with local officials)

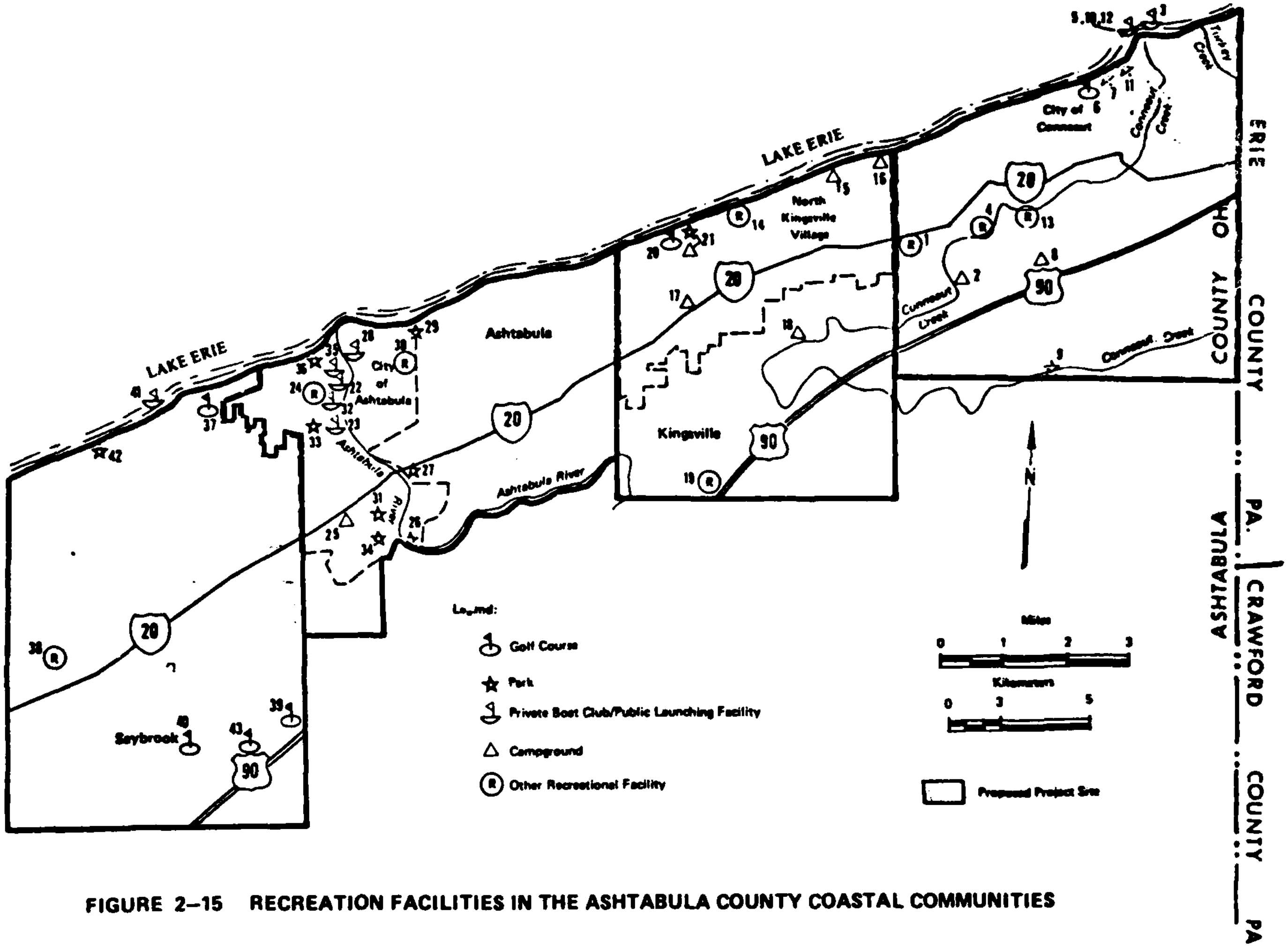


FIGURE 2–15 RECREATION FACILITIES IN THE ASHTABULA COUNTY COASTAL COMMUNITIES

KEY TO FIGURE 2–15

RECREATION FACILITIES IN THE ASHTABULA COUNTY COASTAL COMMUNITIES

Conneaut (City and Township)

1. Amboy Rod and Gun Club
2. Camp Peet
3. Conneaut Boat Club
4. Conneaut Fish and Game Club
5. Conneaut Public Dock
6. Conneaut Shores
7. Conneaut Township Park
8. Evergreen Lake Park
9. Farnham Park
10. Lake Erie Boating Club
11. Lakeview Park
12. Snug Harbor Marina
13. Stream Easement: Conneaut Creek

Kingsville (Township and North Kingsville Village)

14. Buck Lake
15. Camp Luther
16. Camp Calvary
17. Kings Lake
18. Locust Lane Kampgrounds
19. State Rest Area
20. Village Green Golf Course
21. Village Green Park

Ashtabula (City and Township)

22. Ashtabula Yacht Club
23. Brockway Marine
24. Brooker Field
25. Hide-A-Way Campground
26. Indian Trails Park
27. Cederquist Park
28. Jack's Auto Marine
29. Lake Shore Park
30. Massucci Park
31. North Park
32. Riverside Yacht Club
33. Smith Field
34. South Park
35. Sutherland Marine
36. Walnut Beach Park

Saybrook (Township)

37. Ashtabula Country Club
38. Ashtabula Rod and Gun Club
39. Chapel Hills Golf Club
40. Maple Ridge Golf Course
41. Redbrook Boat Club
42. Saybrook Township Park
43. Twin Oaks Par 3

and fishing and picnicking facilities. About half of the total number of berths in the public marina are used by local residents while the rest are used by nonresidents. (2-29)

2.259
In Lake Erie, public fishing takes place from a sheltered area which is part of the Snug Harbor Marina complex; the stone wall just west of the Snug Harbor Marina; and the East and West Harbor breakwalls. Channel catfish, walleye and largemouth bass are among the fish caught in these areas. Conneaut and Turkey Creeks have been designated by Ohio EPA as "Cold Water Fishery" streams and collectively contain at least 40 species of game and forage fish. Ohio fisheries management personnel conduct a stocking program in Turkey Creek with the aim of establishing a salmonid beach fishery (the creek is not stocked or otherwise managed by the Fish Commission in Pennsylvania). Species found in Turkey Creek include rainbow trout, coho salmon, chinook salmon, smallmouth bass, northern pike, suckers, catfish, and several types of sunfish. In the lower reach of Conneaut Creek, anglers take yellow perch, smallmouth bass, coho salmon, chinook salmon, steelhead (rainbow) trout, smelt, several types of catfish, rock bass, bluegills, crappies, freshwater drum, walleyes, suckers, carp, and an occasional muskellunge. Some of the fishing in Conneaut Creek occurs in a stream easement area covering approximately seven acres, or roughly 12,000 shore feet. The Pittsburgh & Conneaut Dock Company presently owns most of the land surrounding the lower two miles of Conneaut Creek, but there is generally unrestricted public access for fishing purposes. There is a boat launching ramp on Conneaut Creek owned by the Pittsburgh & Conneaut Dock Company. However, use of the facility is restricted by low water levels upstream and the low clearances imposed by the non-swinging Bessemer and Lake Erie railroad bridge downstream of the ramp. The Ohio Department of Natural Resources estimated that 125 man-days are expended each year in fishing the 1.5 miles of Turkey Creek in Ohio and for the 24 miles of Conneaut Creek in Ohio the annual man-day estimate is 5,423 (2-30). Further, agency records indicate that the people who fish in Conneaut come from all over the surrounding area, and some from at least as far away as Youngstown, Ohio (2-31). The Conneaut Creek and Turkey Creek watersheds also provide habitat for cottontail rabbits, white-tailed deer, raccoons, squirrels, woodcock, red and grey fox, ruffed grouse, skunks, muskrat, mink, woodchuck, weasels, and numerous other small animals which makes the area attractive to hunters and trappers. Although much of the land is privately-owned, such pursuits are allowed as long as individuals secure the permission of the land owner. There are also several private hunting and fishing clubs in the area. Members of the private Amboy Rod and Gun Club hunt on 70 acres of land and practice skeet and trap shooting on 10 acres. The private

Conneaut Fish and Game Club, which owns approximately 90 acres, has 1,000 shore feet for fishing, and, in addition to hiking, camping, and picnicking facilities, has 10 acres for trap and skeet shooting. In addition to the above, waterfowl hunting is reported to be popular among some area residents at the mouth of Turkey Creek. (2-32)

2.260
Conneaut Township Park (47.5 acres) on Lake Erie provides 1,760 shore feet for fishing and swimming, one boat launching facility, one tennis court, 100 picnic tables, and two ballfields. Lakeview Park covers six acres, and has six picnic tables, two tennis courts, and one lighted ballfield. Farnham Park, which is located outside the city and is not heavily used, covers 82 acres and has 30 picnic tables and one ballfield. Lake swimming also can take place off the town breakwater, west of Township Park along the beach, and at the beaches east and west of Turkey Creek. (2-33) In addition to the public park facilities, privately-owned Evergreen Lake Park (25 acres) is open to the public, and provides areas for fishing, swimming, trailer and tent camping, and picnicking. Another area, 100-acre Camp Peet, was once used as a camping area for organizations such as the Scouts but is currently in a state of disrepair due to vandalism and lack of maintenance. Golf is available at the public Conneaut Shores nine-hole course. This was formerly the site of the Conneaut Country Club, which presently occupies a 350-acre, 18-hole site in Monroe Township.

Future Considerations

2.261
Future recreational needs for Conneaut center around the need for additional boat launching and marina facilities as well as tennis courts. There is also much concern with maintaining the high quality of prime fishing areas, such as Turkey and Conneaut Creeks. To this end, consideration is being given to designating the portion of Conneaut Creek south of Old Main Road a "wild and scenic river." (2-30) Presently, public boat launching facilities are overcrowded especially during weekend periods when delays of one-half hour or more are sometimes experienced. (2-29) In recognition of this need, the Conneaut Port Authority has been considering development of a boat harbor and marina off Lakeview Park, between the breakwater and the public dock. Access would be via Broad Street Lakeview Park. Planned facilities include moorings for 1,000 small boats, launching ramps, winches, a fuel dock, a warehouse, and a restaurant. (2-33) In addition to the existing facilities, a new 33-acre area west of Parrish Road and north of the ConRail tracks has been proposed as a park site. Planned facilities include two ballfields, eight tennis courts, and a children's play area. Funds for this project are pending. (2-32)

b) Other Ohio Coastal Communities

Existing Facilities

Kingsville

2.262
Recreational resources available to the public within the township of Kingsville (excluding North Kingsville Village) include Conneaut Creek for sport fishing and Kings Lake, a privately-owned five-acre recreational area with a man-made lake for swimming, 125 campsites and a two-acre picnic site. Another significant recreation facility located in the central and southern portion of the township is Locust Lane Campgrounds. This site covers 53 acres, has 2,000 linear feet for fishing along Conneaut Creek, and has 70 campsites on 40 acres of land. The most important recreational area in the community of North Kingsville Village is the publicly-owned Village Green. It covers 300 acres, and includes an 18-hole golf course and a campground and park area with two tennis courts, two ballfields, a swimming and fishing area, 50 picnic tables, 80-100 campsites, and snowmobile trails. Estimates indicate that there are, on the average, 500 seasonal users of the campground each year (1 April-31 October), and that this number seems to be increasing. (2-34) Users of this facility come from both inside and outside the community; camping fees are based on North Kingsville Village resident or nonresident status. In addition to the Village Green, North Kingsville is also the site of two private camps, Camp Luther and Camp Calvary, both of which are in the eastern portion of the village on Lake Erie. Camp Luther covers 15 acres and has beach swimming and camping facilities. Camp Calvary has 10 acres of land with camping facilities and two ballfields. North Kingsville also contains a five acre lake (Buck Lake), which is currently used only for fishing.

Ashtabula City

2.263
In Ashtabula City there is a need for more public boat access and a public marina. (2-33) Lake Shore Park currently provides two boat launching ramps (along with picnic tables, tennis courts, and children's play equipment). There are public mooring areas provided by three privately-owned marine equipment suppliers: Jack's Auto Marine, Sutherland Marine, and Brockway Marine (25 moorings). In addition to these public facilities, there are two major private yacht clubs on the Ashtabula River: the Ashtabula Yacht Club (one small boat ramp, 100 moorings) and the Riverside Yacht Club (30 moorings). These clubs do not have launching ramps capable of handling large craft and must either rent a crane or use the hoist at nearby Sutherland Marine. Both clubs are filled to capacity at this

time with a four-year waiting list at the Ashtabula Yacht Club. (2-35) A number of parks are located within Ashtabula City with facilities for hiking, swimming, camping, and organized sports. One such area, Walnut Beach Park covers 18 acres along Lake Erie and has a beach, swimming pool, a two-acre picnic ground, tennis courts and playground equipment. Indian Trails Park, owned by the city, covers 400 acres and follows the Ashtabula River through much of the southern portion of the city. Recreational pursuits include fishing, hiking, trailer camping, picnicking, and horseback riding. A significant aspect of the park is the 20-acre Cederquist Park, which is the site of Little League and Senior League ballfields. This park along with Massucci Park (five acres), Brooker Field (two acres), Smith Field (five acres) and a number of smaller parks, provides space for games for over 50 community ball teams (excluding school teams). In addition to the major parks in the city, there are two "ornamental" parks: North Park (two acres) and South Park (one acre). These parks have no facilities for active recreation.

Saybrook Township

2.264
Saybrook Township is essentially rural, and has limited formal recreational facilities. The major public recreational facility is Saybrook Township Park (eight acres) on Lake Erie, in Saybrook-on-the-Lake. The park has 450 shore feet for swimming and fishing, a small swimming pool, 17 picnic tables, and baseball and tennis facilities. Boating activities are pursued through private organizations such as the Redbrook Boat Club, which has mooring facilities for 50 craft, two launching ramps, and a one-acre picnic area with 20 picnic tables. Hunting and fishing are popular in Saybrook, and the private Ashtabula Rod and Gun Club, which covers 60 acres, is an outlet for these activities. Its facilities include one acre for fishing and canoeing, 15 campsites, and four picnic tables. Approximately 20 acres are devoted to trap and skeet shooting with the remainder of the land being open and essentially considered a scenic or natural area. The club issues 400-500 fishing licenses a year. (2-36) Aside from the facilities of the Ashtabula Rod and Gun Club, pheasant hunting in Saybrook is available on private farm land with the owner's permission and upon signing an Ohio Department of Natural Resources Division of Wildlife cooperative agreement form. There are a number of campgrounds in the township, many of which are located along the shores of Lake Erie. One privately-owned facility, Indian Creek, provides both camping and pool swimming. Saybrook has three private golf courses open to the public, Chapel Hills Golf Club (18 holes, 102 acres), Maple Ridge Golf Court (18 holes, 169 acres), and Twin Oaks Par 3 (9 holes). There is also one private 18-hole course at the Ashtabula Country Club, which also has a swimming pool.

Future Considerations

2.265

It appears existing Village Green facility meets most of the recreational needs of Kingsville. The only planned addition to the complex is another softball field. Future recreational needs for Ashtabula City include additional ballfields, greater public access for launching and mooring of small craft, more beach frontage, and an interest of more tennis courts have been shown. If Federal money can be obtained through the Land Conservation Act, new facilities may be constructed at Walnut Beach Park as follows: three additional tennis courts, two lighted basketball courts, two 24' X 60' picnic pavilions, a concrete boardwalk to within 25 feet of the water's edge, playground equipment, 40 campsites, a security system, asphalt parking lots, and a fence around the entire complex to facilitate traffic regulation. Local officials plan to expand the beach at Walnut Beach Park through the purchase of land west of the present beach, but so far funds for this project are not available. The current trend of the City Recreation Department is to improve present facilities rather than to acquire and develop new areas. (2-33) The recreational resources within Saybrook appear adequate for current needs. At present, there are no plans to develop any new facilities (2-37).

c) The Rest of the Ohio Principal Study Area

2.266

The townships in the rest of the Ohio Principal Study Area are rural in character, with small public parks and private campgrounds being important recreational outlets, as they are in the Coastal Communities. Two of the most important camping areas are in Andover Township: Jeffco Lakes Campground (100 acres, with 35 acres of stocked lakes for fishing, and camping and picnicking facilities), and Resthaven Lakes (100 acres and 5,000 shore feet for fishing, 30 campsites on 50 acres, and 20 picnic tables on 25 acres). Another large campground is Buccaneer Campsites in Jefferson Township. This 80-acre facility has 250 campsites, one ballfield, and areas for fishing, boating, canoeing, swimming, picnicking, and birdwatching. There are also two private horseback riding facilities which cover substantial acreage. Village Hill Stables in Andover owns 126 acres, and has four miles of trails. Pymatuning Ranch, in Williamsfield, covers 230 acres and has three miles of trails. In the rest of the Ohio Principal Study Area there are no public golf courses, but there are two private facilities: the Conneaut Country Club (18 holes, 350 acres) in Monroe Township, and the Pymatuning Valley Golf Course in Andover (9 holes, 68 acres.)

2.267
One of the most heavily used recreational facilities in the Ohio Principal Study Area is the Ohio Pymatuning State Park (2-38), which is located in portions of Richmond, Andover, and Williamsfield Townships. This park borders the man-made Pymatuning Reservoir and has facilities for boating, fishing, hunting, swimming, camping, and picnicking. The park covers 8,466 acres in Ohio, including 3,580 acres of lake. There are moorings for 500 boats, some of which tie up to the shoreline for a $15.00 fee between 1 May-15 November. Other tie-up facilities are built by the boat owners on space leased from the State Park at $25.00 for the season. In addition to mooring spaces, there are five launching ramps, each capable of handling two boats at a time. There are two boat liveries from which it is possible to hire canoes, sailboats, outboards, and pontoon boats. These are Rossi's Boat Livery at the north end of the reservoir and Delaney's Boat Livery at the south end. Fish taken from the Reservoir throughout the year include bluegill, walleye, perch, crappie, and muskellunge. Fishing is allowed all along the shore of the lake, with the exception of the beach areas. Approximately 7,000 fishing licenses are issued each year at Pymatuning. (2-36) Areas within Pymatuning State Park have been designated for hunting with the five miles along the lake north of Ohio State Route 85 and the causeway which crosses the lake into Pennsylvania set aside for this purpose. Game regularly taken from this area include white-tailed deer, cottontail rabbit, pheasant, ruffed grouse, and most importantly, waterfowl (i.e. ducks, Canadian Geese). Within the Park, there are three types of camping sites: Class A, Group, and Primitive. The Class A area provides 434 campsites for both tents and trailers, with electric hookups, a heated washhouse, and laundry facilities. Campers pay $4.00 per night, for a maximum of 14 consecutive nights. The group camping area is available free to qualifying organizations such as the Scouts. This area covers 100 acres, and is divided into two sections, each capable of handling 100 persons, so that more than one group may use the area at a time. Primitive camping is allowed on 10 campsites in a walk-in area (i.e., no vehicles are permitted). Camping there is free of charge. In addition to the camping facilities, 62 housekeeping cabins of two types are available. They are furnished with refrigerators, gas or electric ranges, bedding, and heat. The 27 deluxe cabins are insulated and are open year round. The other 35 are open from 1 April-1 November each year. Lake swimming and picnicking take place in several areas along the Reservoir. One beach near the causeway covers 300 yards, and has 100 picnic tables. One cabin area has a 100-yard beach and a picnic pavilion with grills and 50 tables; the number of tables is apparently going to be cut back. The Class A campground beach covers 100 yards, but is without picnic tables, as campers usually go back to their nearby campsites. There are also five areas set aside

solely for day picnicking. These areas cover a total of approximately 300 acres, and provide 1,100 tables. Other park activities include hiking and winter sports such as ice skating (at the cabin area) and cross-country skiing. There are two hiking trails, each of which is one mile in length. At present, snowmobiling is not permitted, but, according to the Park Director, would be desirable. (2-38) It is presently allowed in eight other Ohio State Parks, and a decision is pending on approval for Pymatuning. Pymatuning visitors come from the local areas and from such distant points as Akron, Cincinnati, Cleveland, Pittsburgh, and Youngstown. In 1976, there were 3.5 million users of the park. This number represents an increase over the 1975 user figure, and it is expected by Park officials that this number will continue to grow because the gasoline price increases may influence more people to vacation locally. (2-39) Park facilities are considered adequate at present, and there are no current plans for expansion or improvement. (2-39) Pymatuning State Park is the most intensively used recreational facility in the Ohio Principal (and Regional) Study Areas. Some Ohio users may travel to the Pennsylvania side of the lake to take advantage of the facilities there, and individuals from locations outside the Regional Study Area may also make extensive use of the Pymatuning facilities.

2.268
Geneva-on-the-Lake State Park covers 682 acres on the shores of Lake Erie in western Ashtabula County. It has 22,000 shore feet for fishing, a small swimming pool, a one-mile hiking trail, three acres for picnicking, with 232 tables, and 365 acres for hunting. A 56-mile portion of the Grand River has been designated by the State as a "wild and scenic river." The "scenic" section extends for 33 miles for the Route 322 bridge in Orwell Township downstream to the Harpersfield covered bridge. The "wild" section runs 23 miles downstream from the Harpersfield covered bridge to the Norfolk and Western Railroad trestle south of Painesville, in Lake County. Thus, approximately 38 designated miles are in Ashtabula County. There is a 34-acre privately-owned stream easement area along the river which provides 67,320 linear feet for fishing, and another 550-acre area with 17,500 linear feet. This river is a key recreational outlet for western Ashtabula County. There are two major State wildlife areas in the rest of the Ohio Regional Study Area. New Lyme Wildlife Area covers 530 acres and is entirely devoted to hunting. The Orwell Wildlife Area covers 197 acres, with 193 acres for hunting and four acres devoted to fishing and boating.

Pennsylvania

2.269
Springfield contains a chain of recreational areas which abut the south shore of Lake Erie (refer to Figure 2-16). These include, from

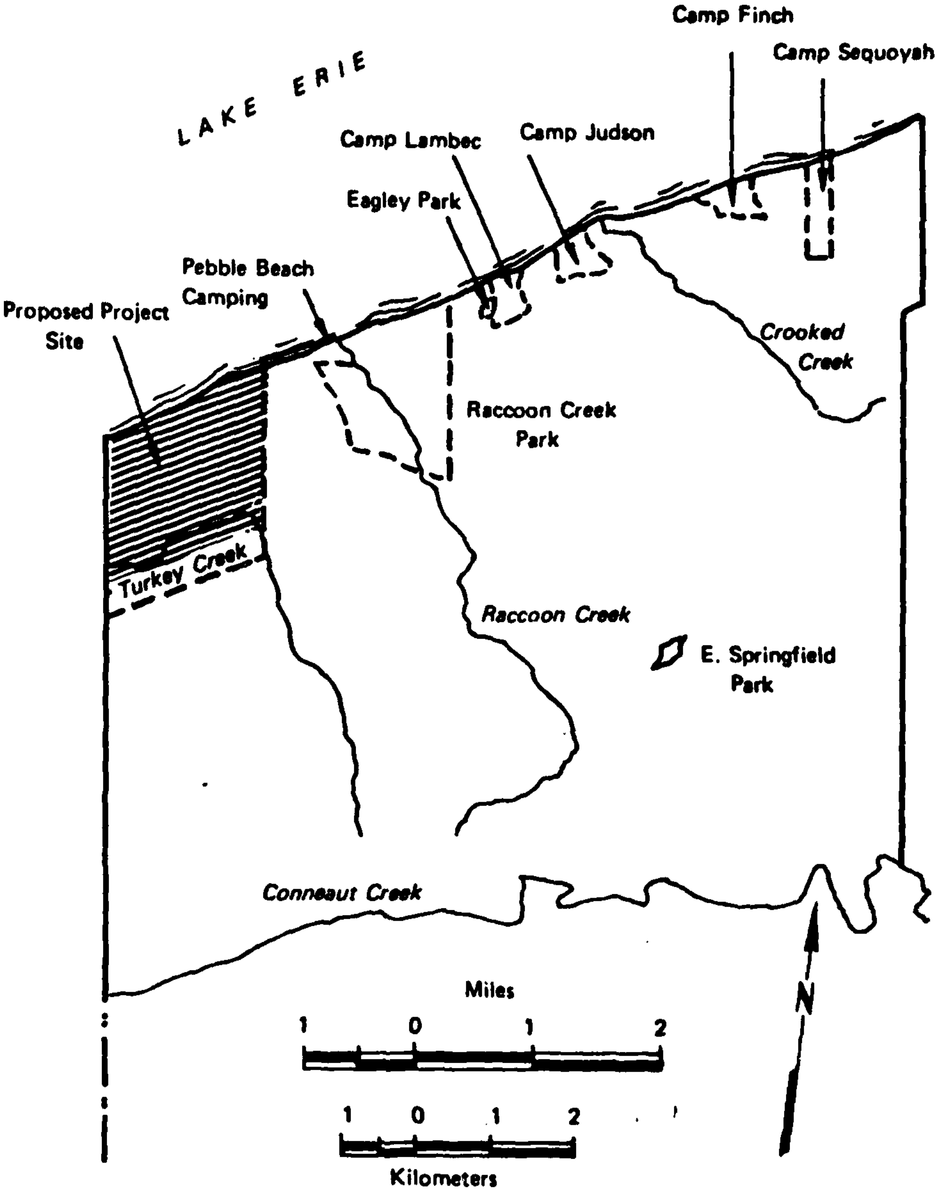


FIGURE 2–16 RECREATIONAL FACILITIES IN THE PENNSYLVANIA LOCAL STUDY AREA

west to east, Raccoon Creek County Park, Eagley Park, and Camps Lambec, Judson, Fitch (YMCA), and Sequoia (Boy Scouts). Raccoon Creek Park is composed of approximately 200 acres and has over 200 feet of Lake Erie frontage. Facilities at the Park include two covered picnic pavilions with numerous picnic tables, grills, and playground equipment. This park also has two miles of hiking trails, 50 campsites, and one boatramp. Springfield Township owns and operates Eagley Park, a 10-acre facility which provides opportunities for beach swimming, picnicking, and field games. East Springfield Park, another public facility, encompasses 16 acres and has two tennis courts and two baseball fields. Camps Lambec, Judson, Fitch, and Sequoia are semi-public facilities and are described below:

- Camp Lambec -- 92 acres owned by the Presbyterian Church.
- Camp Judson -- 115 acres owned by the Northwestern Baptist Association.
- Camp Fitch -- 233 acres owned by the Youngstown YMCA.
- Camp Sequoia -- 394 acres owned by the Boy Scouts of America.

These four camps have a total area of 834 acres and the land within their boundaries is largely undeveloped. Springfield has one privately-owned recreational facility, Pebble Beach Campground, which borders Lake Erie at the northeastern boundary of Raccoon Creek Park and is approximately 2.5 acres in size. Based on the fact that fishing and pleasure boating are constantly growing in popularity, boat launching facilities in Springfield appear to be inadequate. Raccoon Creek County Park has the only ramp in the township. Springfield has no marina facilities; however, Raccoon Creek, along with Crooked Creek, provides both Springfield and the surrounding area with sport fishing opportunities. Species commonly fished for in these creeks include: brown, rainbow and brook trout, chinook and coho salmon and suckers. Springfield Township has two public beach areas; one at Raccoon Creek Park and another at Eagley Park. Both have good road access. These facilities appear adequate for the township; however, beach swimming is generally inadequate for the neighboring Coastal Communities (i.e., Girard and Fairview).

a) Existing Facilities in Other Erie County Coastal Communities

Girard Township

2.270
Lake Erie Campground is a 105-acre general camping facility with approximately 100 campsites and is the major land-based recreational site within this township. Additional mainland recreational facilities include Lake Erie Community Park, Camp Eriez (private), Sisters of the Divine Spirit site, and Camp Sherwin (YMCA). Girard and Lake

City Boroughs contain several small parks as well as many school-controlled playing fields. Additionally, there is a private travelers' camping site on Route 5 in the western half of Lake City Borough. The Overlake Golf Course located in the southern portion of the township is a standard 18-hole golf course with a total of 135 acres. Elk Creek, especially near its juncture with Lake Erie, is the major area for fishing and pleasure boating. Types of fish taken at Elk Creek include brook, brown and rainbow trout, chinook and coho salmon, and largemouth and smallmouth bass. Elk Creek is considered to have adequate public acess to its shores at this time, but marina facilities and other forms of access to Lake Erie are lacking.

Fairview Township

2.271
Recreational facilities in this township include Folly's End Campground (private: approximately 100 acres with 50 campsites), Hawthorne Ridge (privater: 150 acres with pool facilities), and Mar Da Jody Camp (public: 30 acres with 35 campsites, 15 cabins, 30 picnic tables, and some areas devoted to small game hunting). Additionally, in the eastern protion of the township is the Kahkwa Club, a country club with an 18-hole golf course. To the south of Fairview Borough is Commodore Downs, a new horseracing facility, and to the west there is an industrial ballfield. Fairview Borough also has a major general-purpose recreational site in its northwest sector which is operated by the local Veterans' Association. Lakeshore recreational areas include: Great Lake Camp, Camp Notre Dame, Walnut Creek Boat Access Area, and Lake Shore Country Club. Walnut Creek and Trout Run are the two major fishing streams within Fairview Township. A large portion of the latter also passes through Millcreek. Species found in both creeks include brown, brook, and rainbow trout, chinook and coho salmon, largemouth and smallmouth bass, suckers, and other small game fish.

Millcreek Township

2.272
Millcreek Township has no marina facilities, and other than Walnut Creek, there are no important creeks or streams in the township used by the general public for fishing or pleasure boating. On the mainland in Millcreek Township there are four major recreational sites including Waldameer Park (a large natural area), Zuck Park (a county-operated park), and Erie Golf Course (a large (119 acres) private 18-hole golf course). Additional facilities within the township include Algeria Park (county-owned 107 acres), Baer's Trailer Park and Campground (private -- 50 acres, 11 campsites, 11 picnic tables), Cassidy Campground (private -- 17 acres, fishing facilities, 35 campsites, 16 picnic tables), Erie Olympic Swimming Club (private --

3,000 square feet of swimming area), Kelso Beach (private -- 70 acres, boating facilities, two launches, 90 cabins), and Lake Shore Golf (private -- 155 acres, 18 holes).

City of Erie

2.273

Predominant among the city of Erie's mainland recreational facilities is its public park system. There are five parks along the Erie Presque Isle Bayfront: Ravine Park, Lakeside Park, Lawless Playground, and the General Mad Anthony Wayne Memorial Park. Only Ravine and Lakeside Parks afford vehicular access to the shore of Presque Isle Bay. There are five other parks along the shore in the city's northeast section. The largest of the group, Landlighthouse Park, has playground facilities and an historic land lighthouse. The remaining four parks are: Cranch, Lake, Euclid, and Chautauqua Park. None of these has motor vehicle access to Lake Erie. Two other major parks within the city of Erie are Frontier and Glenwood Parks. Frontier Park has facilities for winter sports, footpaths, tennis courts, and a large multi-purpose field. Glenwood Park has a nine-hole golf course, a zoo, a ballfield, tennis courts, an indoor ice rink, and a large picnic area. Presque Isle State Park, the largest coastal recreational facility in the Principal and Regional Study Areas, is located within the bounds of the city of Erie. It forms an excellent natural harbor which affords shelter for boat launchings and marina facilities and many other types of water-related activities. There are six boat launches, 18,000 linear feet of beach, seven miles of hiking trails, 800 picnic tables, and fishing facilities at the park. At 3,200 acres, it is the dominant recreational site in the coastal portion of the Regional Study Area. Its beaches alone are reported to be used by approximately 3.5 million people per year. The Presque Isle Marina is part of Presque Isle State Park and is a State-operated marina providing berths for 430 boats with launching and fueling facilities. Also, there is a private marina, Presque Isle Yacht Club, which maintains berthing facilities for 50 boats, a clubhouse, and launching and fueling facilities. The State leases two additional marinas at Presque Isle to private firms. The first, located on the bay, offers the rental of small outboard motor and rowboats for fishing and pleasure boating. The second, located on the eastern end of the peninsula, near Misery Bay, also offers rental of canoes, small motor and rowboats, and paddle boats. The city of Erie also has the largest facility for boating within the Pennsylvania portion of the Lake Erie shoreline, Erie Yacht Club, located on the southern shore of the bay. This private facility has a large clubhouse, berths for 600 boats, and launching, storage and fueling facilities. Fishing activities are conducted in the nearby Presque Isle Bay area. There are no significant streams or creeks within the city of Erie itself, and mainland fishing activities are absorbed by the surrounding areas.

Other Parts of Erie County

2.274
Shades Beach Park is located in Harbor Creek Township at the mouth of Eight Mile Creek. Its area totals 337 acres, and major activities include picnicking, lake swimming, boating, field games, hiking, etc. Six Mile Creek Park is located in the southern portion of Harbor Creek Township. Totaling 225 acres, it straddles Six Mile Creek for two miles. The main feature of the park is the creek and a 400-foot-deep ravine which provides several scenic views. This park is essentially in a natural state and the county has made few improvements to it. Edinboro Lake County Park is located in Washington Township near the borough of Edinboro on the north shore of Edinboro Lake. This is the smallest of the county's parks, consisting of a one-acre man-made peninsula. However, it is important in that it provides access to one of the county's most desirable inland lakes. This park's recreational value is limited to water-related activities; i.e., fishing, boating, and water skiing. The State of Pennsylvania controls a total of 13,000 acres within Erie County. Of these, the State Game Commission operates 15 game land areas on a total of 9,913 acres. Additional hunting opportunities are provided by the 308 private farms participating in the State game farm program. In Erie County, 35,258 acres are available to hunters on these farms. The Pennsylvania Fish Commission controls 850 acres of land and water in Erie County, 550 acres of which are fish culture station grounds. The Commission has five public fishing and boating access areas, four of which provide lake accesses, the fifth accessing the South Branch of French Creek.

Crawford County

2.275
Pymatuning State Park is the dominant recreational facility in Crawford County and the surrounding area, drawing over four million visitors a year. Bordering a corresponding facility in Ashtabula County, Ohio, this 17,000-acre facility provides opportunities for all types of land and water-related recreation. Present facilities include three boat liveries, seven boat launching areas, four beaches, five picnic areas, three family camping areas with a total of 632 sites, and one group camping area with a capacity of 1,000. Conneaut Lake, including Conneaut Lake Park, is another significant recreational area within Crawford County. Conneaut Lake, Pennsylvania's largest natural lake, is the focal point of a local resort area and provides opportunities for boating, fishing, and swimming. Additionally, there are two 18-hole golf courses, two campgrounds, four ballfields, and an amusement park near the lake. Woodcock Creek Lake and Col. Crawford Park is a 1,700-acre facility (lake area is 330 acres) built by the U.S. Army Corps of Engineers as

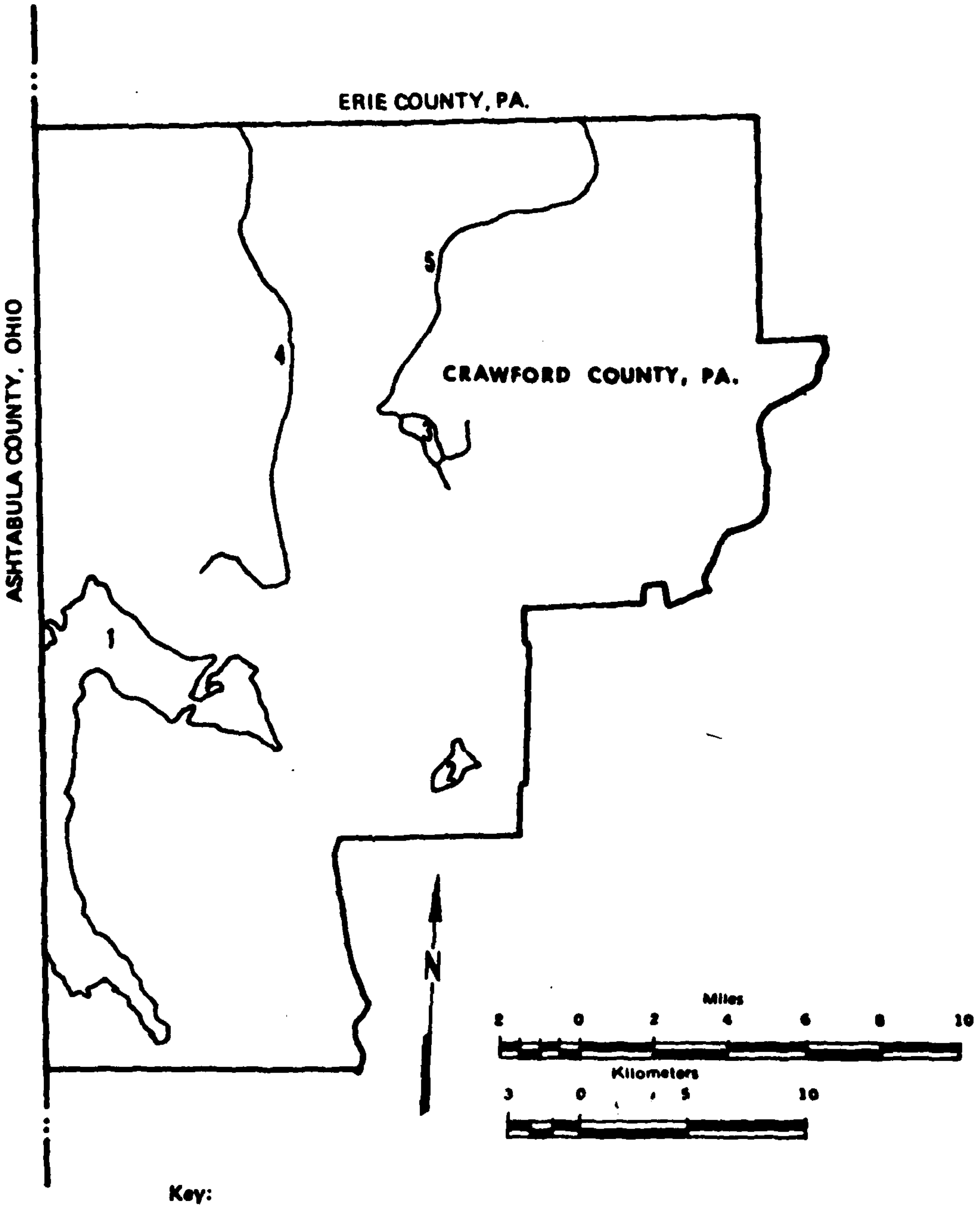
a means of flood control for the French Creek Valley. There are 111 camping sites with spaces for campers, picnic tables, and grills. In addition, there are six picnic shelters and 200 tables found throughout the park. The park provides 250 feet of sand beach bordering nine acres of grass parkland and bathhouse and life guard facilities. Additionally, the park has one large (70 feet wide) launching ramp providing access to the lake for fishing and pleasure boating. There is no fee for boat launching and the 330-acre lake offers anglers a chance at muskellunge, walleye, largemouth and smallmouth bass, and variety of panfish. Other major recreational sites in Crawford County (see Figure 2-17) include:

> Crawford County Fairgrounds which contains two racetracks used for harness and stock car racing. Other facilities include various barns, exhibition halls, display areas, and a trailer camping area.
>
> Erie National Wildlife Refuge which is primarily undeveloped land which serves as conservation and hunting land. This site covers more than 4,000 acres and includes two miles of hiking trails, 50 picnic tables, and six water impoundments.
>
> State Game Lands consisting of 12 acres which serve as game conservation areas and hunting preserves. One of them, Gameland 101 (also known as Jumbo Woods), is about 10 miles south of the proposed project site.

Within Crawford County there are 11 golfing facilities. In addition, there are nine fishing access areas which generally include parking and boat launching and mooring facilities at the major streams and lakes of the region. The Pennsylvania State Game Commission operates a goose management area and a waterfowl museum at Pymatuning.

Pennsylvania Regional Study Area

2.276
Due to a plentiful supply of surface waters (e.g., lakes, creeks, Lake Erie) and relatively unspoiled wooded and open land, boating, fishing, hunting, and, particularly in Erie County, park-related activities are generally the major recreational pursuits within this region. Table 2-169 and 2-170 show respective inventories of recreation facilities in selected communities in the Pennsylvania portion of the Principal Study Area and the entire Pennsylvania portion of the Regional Study Area. The following discussion describes these existing facilities, first of the Coastal Communities from Springfield to Erie, and second of Erie and Crawford Counties as a whole. Figure 2-18 shows the locations of major recreation sites in the Pennsylvania Coastal Communities.



Key:

1. Pymatuning Reservoir
2. Conneaut Lake
3. Woodcock Creek Lake
4. Conneaut Creek
5. French Creek

FIGURE 2–17 MAJOR RECREATIONAL SITES IN CRAWFORD COUNTY

Table 2-169

Existing Recreational Facilities in Selected Pennsylvania Coastal Communities

Ownership Status*	Facility & Location	Total Area (Acres, unless Otherwise noted)	Fishing Areas		Boating Areas	Beach Swimming Areas	Pool Swimming (1000 ft.	Hunting	Hiking Trails (Miles)	Camping		Picnicking	Golf	Field Games
	Erie County		Acres	Miles	No. Launch Ramps	Lin. Ft.				Sites	Cabins	Tables	Holes	
	Springfield													
PR	Brown Camp Grounds	20								75		25		
PU	E. Springfield Park	16												2 (baseball)
C	Raccoon Creek Park	194		X**	1				2	50		30		1
PU	Bagley Park	10				X						X		X
	Girard													
PU	Lake Erie Camp Grounds	105								100				
PR	Overlake Golf	135											18	
	Fairview													
PR	Folly's End Camp Grds.	100								50				
PR	Hawthorne Ridge	150					1		2					
PR	Kahkwa Club	375					2						18	
PU	Mar Da Jody Camp	30						X		35	15	30		
	Millcreek													
C	Algeria Park	107												
PR	Moore Tr.Pk.+Cmp/Gnd.	50								11		75		
PR	Cassidy Cmp.Gnd.	17		X						35		60		
PU	Erie Golf Course	119											18	
PR	Erie Cty. Sw. Club	.5					3							
PR	Kelso Beach	70			2						90			
PR	Lakeshore Golf	155											18	
	Erie City													
PU	Chestnut Park	47					11							X
PU	Glenwood Park	127										100		X (baseball)
PU	Hillside Park	18												X (baseball)
PU	Roger Young Park	20												
PU	Penn Park	16												
S	Presque Isle S.P.	3,200		X	6	17,700		X	7		3	80+		X

* Key to Ownership Status:
PU = Public
PR = Private
S = State
C = County
F = Federal

**X = Activity unquantified, but known to take place

Source: Pennsylvania Office of State Planning and Development, Outdoor Recreation Supply Inventory, 1973-1974.

Table 2-170

Existing Recreational Facilities by County in the Pennsylvania Principal Study Area

Ownership Status*	Facility & Location	Total Area*** (Acres, unless Otherwise Noted)		Fishing Areas		Boating Areas	Beach Swimming Areas	Pool Swimming (1000 Ft²)	Hunting	Hiking Trails (Miles)	Other Trails (Bike, Horse, ORV, Cross-Country Skiing)	Camping		Picnicking	Golf	Field Games
	Erie County	Units	Measure	Acres	Miles	No. Launch Ramps	Lin. Ft.					Sites	Cabins	Tables	Holes	
C	Algeria Park - Millcreek	103												60		X
PU	Albion Boro Park	12														
PR	Alder Brook	3	ML	X**	3											
PR	Beers Tr. Pk. & Cmp. Grd -Millcreek	30										31		75		
PU	Beach Area	4		X		X	100									
PU	Beach Area	2		X		X	300									
PR	Boone Campgrd.-Springfield	20		X								75		25		
PU	Coffing Park	2.5												30		
PR	Camp Glinodo	125						1								
PR	Camp Mystic	61		X		1	800		X		2	30			18	
PR	Campers Hill	90										120		225		
PR	Cassidy Cmp. Grd.-Millcreek	17		X								75		60		
PU	Chestnut Park-Erie	47						11								X
PU	Conneaut Creek	19	ML	X	19											
PR	Conneautee C.B.	8	ML	X	8											
PR	Conneautee C.L.	9	ML	X	9											
PR	Corry Cty. Club	125										30				
PR	Country View	10										100		60		
PR	Crookside	40		X					X	3						
PR	Crooked Creek	6	ML	X	6											
PR	Culbertson Hill	60						6							18	
PR	Downing Golf Club	195														
PU	E. Springfield Park-Springfield	252	W/A	X		2								12		
PU	Eaton Reservoir	750		X		X				4						
PU	Edinboro Lake	252	W/A	X		2										
PU	Edinboro - 1 Unit	10/5	W/A	X		X			X							X
PR	Elgin Rec. Area	16														
PR	Erie Golf Course-Millcreek	119													18	
PR	Erie Gym. Sw. Club-Millcreek	.5						3								
PR	Family AF Camp Ground	15														
PU	Penn Game 112	6,100							X							
PU	Penn Game 193	15,070							X							
PU	Penn Game 73	13,770							X							
PU	Penn Game 77	112							X							
PU	Penn Game 82	276							X							
PR	Polly's End Cmp.grd.-Fairview	100														
PR	Fourmile Creek	36	ML	X	36	X										
PU	Frontier Park	35														X

*Key to Ownership Status:
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F = Federal

**X = Activity unquantified, but known to take place.

***Key to Measurement Type:
ML = Miles
W/A = Water Areas

Table 2-170 (Continued)

Ownership Status*	Facility & Location	Total Area*** (Acres, unless otherwise noted)		Fishing Areas		Boating Areas	Beach Swimming Areas	Pool Swimming (1000 Ft²)	Hunting	Hiking Trails (Miles)	Other Trails (bike, horse, ORV, cross-country skiing)	Camping		Picnicking	Golf	Field Games
	Erie County	Units	[illegible]	Acres	Miles	No. Launch Ramps	Lin. Ft.					Sites	Cabin	Table	Holes	
PU	Glenwood Park	127												100		X
PR	Gospel Hill Golf	150													18	
PU	Gravel Pit Park	5												50		X
PR	Hose Creek	4	mi		4											
PR	Hawthorne Ridge-Fairview	150						1		2						
PU	Hillside Park	10														X
PR	Holiday Acres	400														
PR	Horseshoe Lake-Camp Ground	10										80		30		
PU	Hubbel Run	3			3											
PR	Kahkwa Club-Fairview	373						1							18	
PU	Kelso Beach-Millcreek	90				2							90			
PR	KOA Camp	13										60				
F	Lake Erie	52,762				8										
PU	Lake Erie Community Park Girard	105														
PU	Lake Pleasant	60		X**		1						100				
PR	Lakeshore Golf-Millcreek	155													18	
PR	Lakeview Golf	250													14	
PR	Lawrence Park, Golf	130													18	
PU	LeBoeuf Lake	62		X		2										
PU	LeBoeuf Creek	12		X		X										
PU	Leisure Lake	75		X		X						62		65		
PU	Mallick Road Park	177								7						
PR	Mar Da Jody Camp-Fairview	30							X			35	15	30		
PR	Reed Park	17		X						1				30		
PU	Reed Park	30		X						1				100		
PR	Route Campsites	5										40				
PR	Overlake Golf, Girard	135													18	
PR	Picnicana	22								1				30		X
F	Presque Isle, S.P. Erie	3,200		X		6	17,700		X	7			3	800		X
PU	S & H Camp Grounds	30						1				100				
C	Sorrento Creek Park-Springfield	194		X		1				2		50		30		X
PU	Roger Young Park-Erie	30														
PR	Rolling Ridge Park	15												6		X
PU	Rose Park, Erie	16														
PR	Rosalie Riding	30									X					
PU	Hunting Safety Range	50,003							X							
S	State Game Lands	10,030							X	10						
C	Shades Beach Park	337		X		1				10	10	12		45		
C	Six M. Creek Park	250								2		30				

* Key to Ownership Status:
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F = Federal

**X = Activity unquantified, but known to take place

*** = Key to measurement type
mi = miles
W/A = Water Acres

Table 2-170 (Continued)

Ownership Status*	Facility & Location	Total Area*** (Acres, unless otherwise noted) Units	Measure	Fishing Areas Acres	Fishing Areas Miles	Boating Areas No. Launch Ramps	Beach Swimming Areas Lin. Ft.	Pool Swimming (1000 Ft²)	Hunting	Hiking Trails (Miles)	Other Trails (bike, horse, ORV, cross-country, skiing)	Camping Sites	Camping Acres	Picnicking Tables	Golf Holes	Field Games
	Crawford County															
PR	[illegible] Camp	24										100		120		
	Canadian-American Golf Course														18 9	
PR	[illegible] Lake	75					400									
PR	Clear Lake	86		X**		9										
PR	Canadohta Lake	170		X		9										
PR	Conneaut Creek	17	mi	X	17											
PR	Conneaut Lake	928		X		2										
PR	Conneaut Lake Park	100		X		1								925		
S	Conneaut Outlet	13	mi	X	12							30				
PR	[illegible] Camp	10														
PR	Crooked Creek	6	mi	X	6											
PR	Cross Creek Run	7						13			2				18	
S	Crystal Lake	50		X												
PR	[illegible]										2					
PR	[illegible] Hill Run	60		X		X										
	Edgewater Golf Course														9	
	Erie Wildlife Refuge	100		X		9										
PR	Fairyland Forest	15														
PR	Pa. Game Comm. 101	4,493							X							
PR	Pa. Game Comm. 116	6,082							X							
PR	Pa. Game Comm. 173	5,900							X							
PR	Pa. Game Comm. 219	7,548							X							
PR	Pa. Game Comm. 77	16,131							X							
PR	Pa. Game Comm. 85	11,412							X							
PR	Pa. Game Comm. 82	12,717							X							
PR	Pa. Game Comm. 97	8,576							X							
PR	Five Mile Creek	2	mi	X												
PR	Flying Feather	300							300 Acres							
PR	French Creek	61	mi	X		X										
S	Game Land 69	351		X		X										
PR	Gordon Hotel							50								
PR	Green Acres, Golf														9	
PR	[illegible], Golf														9	
PR	[illegible], Golf	100													18	
S	[illegible] Marsh	800		X		X										
PR	Hemlock Lakes	100		X	1				X							
PR	Indian [illegible] Camp	35		X						3		25		4		
PR	James D. Aley	114								2		55				
PR	[illegible] Lake	170		X		X										
	[illegible] Golf Course														9	
PR	Lakeside Camp	30										30				

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** X - Activity unquantified, but known to take place

*** Key to Measurement Type

mi = Miles
W/A = Water Acres

Table 2-170 (Continued)

Ownership Status*	Facility & Location	Total Acreage (Acres, unless otherwise noted)		Fishing Areas		Boating Areas	Beach Swimming Areas	Pool Swimming (1000 Ft²)	Hunting	Hiking Trails (Miles)	Other trails (bike, horse, ORV, cross-country, skiing)	Camping		Picnicking	Golf	Field Games
	Crawford County	Units	Measure	Area	Miles	No. Launch Ramps	Lin. Ft.					Sites	Cabins	Tables	Holes	
PR	Linesville Creek	5	ml		3											
PR	McKinley Hotel							8						10		
PR	McLaughlin Run	2	ml		3											
C	Meadville County Park	30														
PR	Meadville Pines Golf Course														18	
PR	Muddy Creek	9	ml	X**	9											
PR	Oakland Beach														18	
PR	Oil Creek	12	ml	X	12											
PR	Oil Creek EB	11	ml	X	11											
PR	Oil Creek WB	7	ml	X	7											
PR	Park Golf Course														18	
PR	Pine Lake Camps	100						1		3	X	32		40		
PR	Pine View Camp	75									X	200				
PR	Playland Camp	300								5		150				
PR	Puckerbrush Fish	27		X												
S	Pymatuning Lake	16,500		X		9										
S	Pymatuning S.P.	22,400		X		9	42			2	X	820		825		X
PR	Riverside Golf Course														18	
PR	Sunnybrook Camp	75														
PR	Rustic Hills Camp	90										400		500		X
PR	Hunting Safety Zone	41,399										100				
S	State Game Lands	23,540								15		8				
PR	Shangri-La Camp	57						16				700				X
PR	Sugar Creek	4	ml	X												
S	Sugar Lake	150		X		9										
PR	Sugar Creek L.T.	10	ml	X												
S	Tamarack Lake	356		X		9										
PR	The Woods	10												50		
PR	Trails End Camp	5										25				
PR	United Camp Ground	10										100				
PR	Walnut Creek Golf Course	–													9	
S	Western Game Farm	367														
PR	Whispering Pines Golf Course														18*	
PR	Whisper Trails	100										15				
S	Wild Waterfowl (Game Farm)	63														
PR	Woodcock Creek	12	ml	X	12											
F	Woodcock Creek Lake	1,732		X		X										
PR	3M Camp Ground	35		X		13	100		X							

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** X = Activity unquantified, but known to take place

*** Key to measurement type:
mi = miles
W/A = Water Acres

Source: Pennsylvania Office of State Planning and Development, Outdoor Recreation Supply Inventory, 1973-1974.

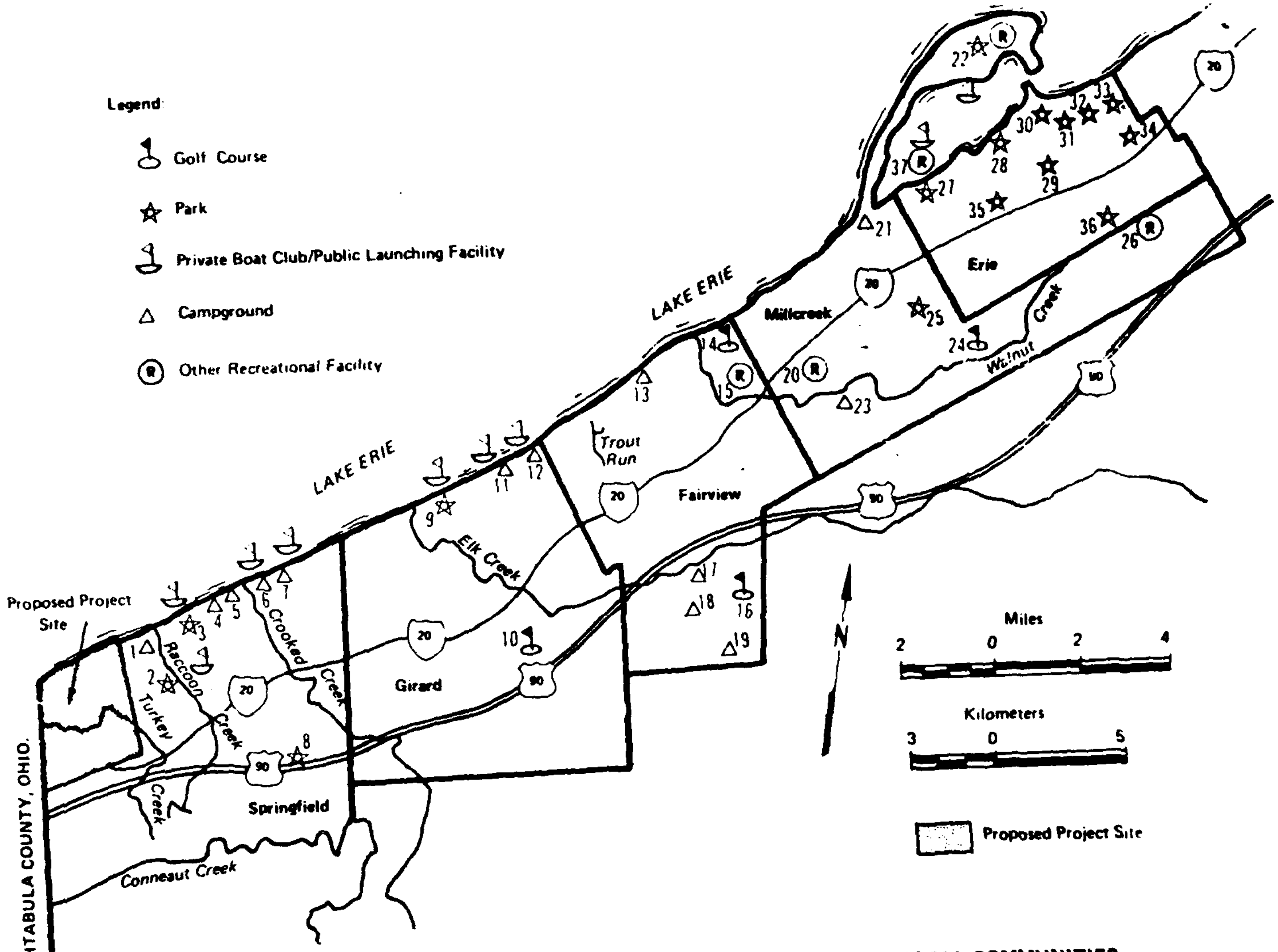

FIGURE 2–18 MAJOR RECREATIONAL SITES IN THE ERIE COUNTY COASTAL COMMUNITIES

KEY TO FIGURE 2–18

MAJOR RECREATIONAL SITES IN THE ERIE COUNTY COASTAL COMMUNITIES

Springfield Township

1. Pebble Beach Camping
2. Raccoon Creek Park
3. Eagley Park
4. Camp Lambec
5. Camp Judson
6. Camp Finch
7. Camp Sequoia
8. East Springfield Park

A. Raccoon Creek
B. Crooked Creek

Girard Township

9. Lake Erie Community Park
10. Overlake Golf Course
11. Camp Eriez
12. Camp Sherwin

A. Elk Creek

Fairview Township

13. Camp Notre Dame
14. Lakeshore Golf Course
15. Kahkwa Club
16. Elk Valley Golf Club
17. Folly's End Campground
18. Hawthorne Ridge
19. Mar Da Jody Camp

A. Trout Run
B. Walnut Creek

Millcreek Township

20. Asbury Woods
21. Baer's Trailer Park and Campground
22. Cassidy Campground
23. Erie Country Club
24. Zuck Park
25. Erie Olympic Swimming Club

City of Erie

26. Presque Isle Marina and State Park
27. Ravine Park
28. Lakeside Park
29. Mad Anthony Wayne Memorial Park
30. Lighthouse Park
31. Cranch Park
32. Lake Park
33. Euclid Park
34. Chatauqua Park
35. Frontier Park
36. Glenwood Park
37. Erie Yacht Club

Future Considerations in the Pennsylvania Regional Study Area

Erie County

2.277
Erie County has a park development program which anticipates expenditures of $3.3 million by 1980 for the development of Shades Beach, Raccoon Creek, Zuck, and Algeria Farm Parks. The preceding four parks were considered most essential and of first priority for improvement and development because of their proximity to population centers overall potential, and present state of development. In general, development plans consist of improving roadways and parking facilities, additional picnicking areas, tennis courts, and biking paths. Six Mile Creek Park provides the greatest potential for development in future years, as the demand for recreational space in Erie County grows. The County has formulated tentative plans to develop the area's potential for winter sports, as its topography is the most appropriate of all of the county parks for this purpose. Plans for additional summer recreation include facilities for picnicking, hiking, camping, creek fishing, etc. (2-40) Algeria Farm Park, located in Millcreek Township, is the most recent addition to the county park system and being adjacent to the lakefront, it provides additional public access to Presque Isle Bay. Once developed, this 107-acre facility will provide recreational opportunities for activities such as boating, fishing, water skiing, picnicking, hiking, biking, etc. Additionally, the Pennsylvania Fish Commission, with Erie County, has long-range plans to develop two small boat harbors; one, at the Walnut Creek access area, and the other at the mouth of Elk Creek. The facility proposed for Elk Creek is planned to contain a 500-boat marina with support facilities.

Crawford County

2.278
As stated in the Crawford County Recreation and Open Space Plan, current recreational demand outweighs current supply in several activity categories. This statement is based upon activity day guidelines which are a measure per capita recreation use per facility per day. The adequacy of the current facilities' ability to satisfy current demand or participation is determinable in a quasi-quantitative manner. Crawford County's analysis (which was performed in 1973) concludes that the greatest demand is found for activities like pleasure driving and walking, swimming, and playing outdoor games and sports. Table 2-171 describes the major deficiencies in required units/acres projected by the county to satisfy projected demand in future years. The table indicates that as of 1973, the county's most important perceived recreational needs were:

- 114 acres for outdoor sports,

Table 2-171

Recreation Needs in Crawford County

	Total 1973 Demand (000's Activity Days)	Required		Existing		Current Needs		Additional Projected Needs					
								1980		1990		2000	
		Units	Acres	Units	Acres	Units	Acres	Units	Acres	Units	Acres	Units	Acres
Outdoor Sports(1)	807	124	124	10	10	114	114	13	13	9	9	11	11
Swimming Facilities(2)	411	3.2	---	0	---	3.2	---	0.3	---	0.2	---	0.3	---
Bicycle Trails(3)	327	91	---	0	---	91	---	10	---	7	---	8	---
Picnic Grounds(4)	724	574	57	100	.5	474	52	60	6	41	4	53	5
Walking/ Hiking Trails(5)	171	17.5	14	0	---	17.5	14	1.2	1.4	0.8	1	1.1	1.3
Boating Facilities(6)	124	635	---	0	---	635	635	66	---	46	---	58	---
Campgrounds(7)	55	87	11	39	4	46	7	9	1	6	0.8	8	1
Ice Skating Facilities(8)	35	1.3	0.3	0	---	1.3	0.3	0.1	0.03	0.1	0.02	0.1	0.02

---

(1) 1 Unit = 1 Acre

(2) 1 Unit = Capacity for 392 people

(3) 1 Unit = 1 Mile

(4) 1 Unit = 1 Picnic Table

(5) 1 Unit = 1 Mile

(6) 1 Unit = Capacity for 3 people

(7) 1 Unit = 1 Tent or Trailer site

(8) 1 Unit = Capacity for 363 people

Source: "Recreation and Open Space Plan, Crawford County, Pennsylvania," Beckman, Yoder and Seay, Inc.

- swimming facilities for 1,254 people,
- 91 miles of bicycle trails,
- 52 acres of picnic grounds,
- 17.5 miles of nature trails,
- 7 acres of campgrounds for 46 campsites, and
- ice skating facilities for 472 persons.

Three creeks within Crawford County have been classified as First Priority - Group A Scenic Rivers. This means that in the judgment of the Pennsylvania Department of Environmental Resources, these waterways are among those that have the most urgent need for protection. They are French Creek, Cussewago Creek, and Muddy Creek.

Social Services

2.279
Social service programs are carried out through local public entities with the mandate for such programs typically coming from the State and Federal levels. Due to significant differences between Ohio and Pennsylvania relative to sources of funding as well as program types, the description of social services in the Ohio Regional Study Area is presented separately from that for Pennsylvania in most sections below. However, there are Federal programs that are common to both States.

a) Federally Mandated Programs

Aid to Families with Dependent Children

2.280
The AFDC program is designed to assist in the care of needy dependent children in their homes or in the home of a relative. Such aid can consist of financial assistance or foster care when applicable. The non-Federal financing of this assistance and associated administrative costs is based upon a matching formula utilizing State and county funds. The principal funding sources are the Federal Government and the State of Ohio's general fund, with the local contribution limited to not more than 10 percent of the non-Federal share. Financial assistance is usually made in the form of monetary payments to cover the cost of food and clothing and any additional items necessary for daily living. Since one of the main goals of the program is to maintain children in their own homes, payments are made to whomever is caring for the child. In some cases, payments are made to another person on behalf of the child. Payments are also made for eligible children in institutions and foster homes, and for the repair of homes in which needy families with dependent children are living.

Medicaid

2.281
This program is designed to provide medical care for "categorically needy" recipients (i.e., those already receiving cash assistance under another program) and others considered "medically needy." The medically needy are not receiving cash assistance under other programs, but are eligible for medical services because (according to State standards) their income is not great enough to meet the cost of basic medical care. Formula grants are made by the Federal Government to States such as Ohio and Pennsylvania that provide specific health care services for medically needy and other specified client groups. The services include:

> Inpatient hospital care for illnesses other than tuberculosis or mental disease,
>
> Outpatient hospital services,
>
> Other laboratory and X-ray services,
>
> Skilled nursing home services for people 21 and over,
>
> Home health services for any eligible individual entitled to skilled nursing home services,
>
> Early and periodic screening, diagnosis, and treatment for individuals under 21,
>
> Family planning services, and
>
> Physicians services.

In addition to the services listed above, there are 16 optional Medicaid services offered to categorically needy recipients (i.e., cash assistance recipients).

Food Stamp Program

2.282
The Food Stamp Program is designed to help individuals and families purchase food. Recipients buy stamps or coupons which are used to purchase food items. The value of the food purchased with the coupons exceeds the dollar cost of the coupons to the recipient. The quantity of coupons or stamps which may be purchased varies according to family income and size.

Supplemental Security Income (SSI)

2.283
SSI is an additional cash assistance program. Prior to 1974, there were three State-run, Federally-assisted programs for the aged, blind, and disabled. However, effective 1 January 1974, these programs were consolidated into a single comprehensive program with the administrative responsibility for the program belonging to the Social Security Administration. The program is financed from the general funds of the U.S. Treasury. The purpose of the program is to supplement an individual's income such that basic needs (e.g., food, shelter, clothing) are met. The program not only provides direct cash payments, but the recipient is also eligible for medical benefits and social services.

b) Ohio Regional Study Area

2.284
Social services in Ashtabula County are organized into approximately 12 service areas ranging from financial assistance to basic material needs. There are over 95 programs offered within the service areas that are administered through more than 35 private agencies and 20 public agencies, including the Ashtabula County Welfare Department. The entire county is serviced by the County Welfare Department, located in the city of Ashtabula. Most of the social services are provided either through the Welfare Department or by other agencies located in the city of Ashtabula and the city of Conneaut, the major concentrations of population in the county. Financial assistance or income maintenance programs administered by County Welfare Department include the following: Aid to Families with Dependent Children, Medicaid, General Relief Assistance, and Emergency Financial Assistance. The basic structure of the first two programs was discussed previously. The General Relief Assistance program is designed to assist financially those individuals who are ineligible to receive financial aid under one of the Federal public assistance programs. Recipients are generally individuals who are over 18 years and under 65 years, who are not disabled, blind, or are without dependent children. The State and the county (Ashtabula County) determine both the dollar amount paid and the eligibility requirements. The Emergency Financial Assistance program is designed to provide minimal assistance on a shortterm basis to individuals and families during emergency and crisis situations prior to more long-term solutions such as General Relief Assistance.

2.285
In addition to the above financial assistance programs, a number of human service programs are provided by various public and private

(e.g., United Way) agencies. These services complement those provided under Title XX of the Social Security Act and include:

House Search Assistance,

Protection of Adults from Neglect, Abuse, Exploitation,

Allocating and Agency Relation,

Program Coordination,

School Social Worker,

Health Screening - Children, and

Health Screening - General.

The major financial assistance programs at the county level in Ohio are AFDC, Medicaid, and General Relief. The number of AFDC recipients in Ashtabula County has risen from 6,385 in 1970 to 18,761 in 1976, an average annual rate of increase of almost 20 percent (see Table 2-172). During the same period, the total costs for program administration and payments have risen at an average annual rate of 24 percent to $3.5 million in 1976. The proportion of total costs paid for by county sources has varied from a low of 2.6 percent in 1970 to a high of 4.7 percent in 1973 and 1974. In 1976, the share stood at 3.7 percent. The county's share of Medicaid costs amounted to only $5,892 in 1976, or four percent of total program administrative costs, the $6 million for actual payments represented Federal costs (see Table 2-173). While the dollar value of medical payments has increased 300 percent since 1974, payments by the county for administrative costs have risen only 62 percent or about 27 percent per year. Between 1970 and 1976, the number of recipients participating in the State of Ohio General Relief Assistance program has declined from 5,069 to 3,635 (see Table 2-174). However, the total program costs have remained constant, while county costs have risen modestly from $74,000 in 1970 to $94,000 in 1976 (four percent per year). The county's share of the total cost of the program has increased from 15 percent in 1970 to 19 percent in 1976. On a per capita basis, the costs to the county have remained constant at $0.75.

c) Pennsylvania Regional Study Area

2.286
Pennsylvania's welfare system is organized differently from that of Ohio. In contrast to Ohio, where the assistance and administrative costs of certain programs are shared by the State and the counties,

Table 2-172

Number of Recipients and Program Costs For Aid to Families with Dependent Children (AFDC) In the Ohio Regional Study Area--1970--1976

	1970	1971	1972	1973	1974	1975	1976	Average Annual Growth Rate (%) 1970-1976
Number of Recipients	6385	9535	12,182	13,706	13,268	16,778	18,761	19.7%
Total Costs (Administrative & Payments)	$952,322	$1,384,028	$1,825,335	$1,933,118	$1,962,902	$2,816,448	$3,500,297	24.2
County Costs	$24,385	$37,757	$62,373	$90,099	$91,795	$109,588	$130,766	32.1
County Share as a Percentage of Total Costs	2.6%	2.7%	3.4%	4.7%	4.7%	4.0%	3.7%	--
County Cost Per Recipient	$3.82	$3.96	$5.12	$6.57	$6.92	$6.53	$6.97	10.5
County Cost Per Capita	$0.25	N/A	N/A	N/A	N/A	$1.07	N/A	

N/A= Not Available.

Source: Ashtabula County Welfare Department; Arthur D. Little, Inc. estimates.

Table 2-173

Number of Recipients and Program Costs of Medicaid in the Ohio Regional Study Area -- 1974-1976(1)

	1974	1975	1976	Average Annual Growth Rate 1974-1976
Number of Recipients	31,417(2)	19,903	22,158	-16.0%
Medical Payments (Federal Cost)	$1,542,504(2)	$4,010,556(2)	$5,996,947	97.2
Total Administrative Costs	$76,632	$120,137	$145,459	37.8
County Administrative Cost	$3,632	$5,288	$5,892	27.4
County Share as a Percent of Total Administrative Costs	4.7%	4.4%	4.0%	-
County Cost per Recipient	$0.12	$0.27	$0.27	50.0
County Cost per Capita	N/A	$0.05	N/A	-

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(1) These costs were included in another program--"Adult Program"--from 1970 through the first half of 1974.

(2) Estimated.

Source: Ashtabula County Welfare Department; Arthur D. Little, Inc. estimates.

Table 2-174

Number of Recipients and Program Costs for General Relief in the Ohio Regional Study Area -- 1970-1976

	1970	1971	1972	1973	1974	1975	1976	Average Annual Growth Rate 1974-1976
Number of Recipients	5,069	4,998	2,699	1,430	1,277	2,931	3,635	-5.5%
Program Cost (Administrative & Payments)	$489,791	$577,574	$591,261	$366,243	$198,663	$425,273	$489,728	0.0
County Cost	$ 73,942	$ 88,100	$109,354	$ 90,159	$ 49,460	$ 77,425	$ 94,055	4.1
County Share of Total Costs (%)	15.1%	15.2%	18.4%	24.6%	24.9%	19.2%	19.2%	
County Cost Per Recipient	$14.58	$17.63	$40.52	$63.05	$38.73	$26.41	$25.87	10.0
County Cost Per Capita	$ 0.75	N/A	N/A	N/A	N/A	$ 0.76	N/A	

N/A = Not Available.

Source: Ashtabula County Welfare Department; Arthur D. Little, Inc. estimates.

Pennsylvania's assistance and administrative costs for most programs are supported by State funds only, with no cost to the counties. There are, however, some programs that have a cost to the county, including: Child Welfare, Council on Aging, and the Mental Health/Mental Retardation (MH/MR) program. These programs are State supported, but county administered, with the county commissioners contributing funds toward administrative costs. The funding formula for the MH/MR program is 90 percent State and 10 percent county for outpatient type programs only, all other MH/MR programs are 100 percent State-funded.

2.287
For the Child Welfare Program, the State pays up to a maximum of 90 percent of the costs for the direct payments to children. However, the actual percentage each year is determined in part by the availability of State funds. In addition, a formula based on county real estate values is used to determine the county's portion of the payments programs. The Juvenile Act Program, another component of the Child Welfare Program, is a program for court-committed children and has been funded on an equal share basis by the State and county since the program began in 1974. Since the State assumes a major burden of the costs associated with Federally mandated welfare programs, the cost impact on county jurisdictions in Pennsylvania is minimal. For example, in Fiscal Year 1976, a total of $28.8 million in administrative and payments costs were paid out by the State for recipients in Erie County under AFDC, General Assistance, and Medicaid; the total State cost for the same programs in Crawford County came to $9 million, bringing the grand total for the Pennsylvania Regional Study Area to $37.8 million (refer to Table 2-175). For those social welfare programs at least partially funded by local jurisdictions, Erie County had to fund only $1.24 million and Crawford $250,000. For the entire Regional Study Area, the combined county share for social welfare programs amounts to $4.20* per resident (refer to Table 2-176). However, the largest proportion of the counties' costs were accounted for by the Child Welfare Program (83 percent).

d) Projections of Social Welfare Costs

2.288
The costs to the counties for providing major social welfare programs in both the Ohio and Pennsylvania Regional Study Areas are relatively modest when measured on a per capita basis: approximately $1.90** in Ohio and $4.20* in Pennsylvania. For the future, it is difficult to

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* $4.20 is rounded from the sum of the 1975 per capita cost as shown in Table 2-176.

** $1.90 is rounded from the sum of the 1975 per capita cost as shown in Tables 2-172, 2-173, and 2-174.

Table 2-175

Social Welfare Program Totally Funded by the State of Pennsylvania for Erie and Crawford Counties in Fiscal Year 1975-1976

	Erie County	Crawford County	Total
Aid for Families with Dependent Children (AFDC)			
State Costs (000$)	$14,513	$3,765	$18,278
Average Monthly Number of Recipients	14,063	3,808	17,871
General Assistance			
State Costs (000$)	$ 3,607	$ 915	$ 4,522
Average Monthly Number of Recipients	2,376	676	3,052
Medicaid (000$)			
State Costs	$10,721	$ 4,331	$15,052
Medically Needy	4,962	2,867	7,829
Categorically Eligibles	5,759	1,464	7,223
Total State Cost of All Programs	$28,841	$ 9,011	$37,852

Source: Pennsylvania Department of Public Welfare, Office of Income, Maintenance, Research and Statistics.

Table 2-176

Social Welfare Programs Partially Funded by Erie and Crawford Counties in Fiscal Year 1975-1976

	Erie County	Crawford County	Total
Mental Health/Mental Retardation (1)			
Program Cost (000$)	$6,300	$ 999	$7,295
County Cost (000$)	94	52.5	146.5
County Cost Per Capita	0.35	0.62	0.41
Council on Aging (2)			
Program Cost (000$)	$ 966	$ 331	$1,297
County Cost (000$)	97.3	10.8	108.1
County Cost Per Capita	0.36	0.13	0.30
Child Welfare (3)			
Program Cost (000$)	$1,808	$ 198	$2,006
County Cost (000$)	709	105	814
County Cost Per Capita	2.61	1.23	2.28
Juvenile Act Program (3)			
Program Cost (000$)	$ 680	$ 166	$ 846
County Cost (000$)	340	83	423
County Cost Per Capita	1.25	0.98	1.19
Total Child Welfare County Cost Per Capita	$ 3.86	$ 2.21	$ 3.47
Total County Social Welfare Programs			
Total County Cost (000$)	$1,240.3	$251.3	$1,491.6
Total County Cost Per Capita	4.57	2.96	4.18

Sources: (1) Pennsylvania Bureau of County Programs, Office of Mental Health.

(2) Pennsylvania Dept. of Public Welfare, Office of Aging, Div. of Program Management.

(3) Pennslyvania Dept. of Public Welfare, Office of Children and Youth.

project possible changes in such programs and the allocation of costs among the various levels of Government (Federal, State, and county). In addition, changing eligibility requirements regarding participation in these programs can dramatically affect program costs and thus the county burden. Therefore, for the purpose of the baseline projections, the relatively modest per capita figures of $1.90 and $4.20 are assumed to remain constant throughout the forecast period.

General Government Services and Employment

2.289
General Government pertains to a variety of county and local Government services in the Coastal Communities. Table 2-177 shows the specific governmental functions included in the category. For the municipalities and townships in the Coastal Communities, general Government functions consist primarily of administrative and financial functions, or what the U.S. Bureau of the Census refers to as financial administration and control. These functions are common to levels and all sizes of local Government and generally cover the day-to-day conduct of public business. For the larger municipalities (e.g., Conneaut and Ashtabula City), and for the counties, public health is also a significant function of general Government, but not nearly as large as financial administration and general control. For the smaller municipalities and townships, public health functions are relatively minor and are limited primarily to protective inspections. Corrections are exclusively a county function and in terms of employment and expenditures is a major sector of general Government.

b) Services

2.290
For the smaller municipalities and townships in the Coastal Communities, general Government consists almost exclusively of financial administration and general control. Employment in general Government functions in these areas is limited primarily to part-time elected officials, a full- or part-time clerk, and, in some cases, a full- or part-time zoning official. In Conneaut and Ashtabula, public health is an important function of general Government along with financial administration and general control. Conneaut has four full-time employees working in health-related activities (see Table 2-178). Most of Conneaut's general Government employees perform clerical, or secretarial duties and work in the offices of Conneaut's elected officials (auditor, treasurer, etc.). Employment by category with the Conneaut City Government is presented in Table 2-178. Ashtabula City has a general Government employment pattern similar to

Table 2-177

General Government Functions

● Financial Administration:	Activities concerned with tax assessment and collection, custody and disbursement of funds, debt management, administration of trust funds, budgeting, and other government-wide financial management activities.
● General Control:	Judicial, legislative, and administrative staff service agencies of government--includes planning and zoning activities conduct of elections, central personnel and administrative services, legislative activities, and court and court-related activities.
● Health:	Administration of public health programs, community and visiting nurses services, inspection of water supply, food handling establishments, and water pollution control.
● Corrections:	Activities pertaining to the confinement, correction, and rehabilitation of adults and minors convicted of criminal offenses; includes pardon, probation, and parole activities.

Source: 1972 Census of Public Employment, U.S. Department of Commerce, Bureau of the Census.

Table 2-178

Conneaut General Government Employees -- 1977

Function/Department	Full-Time	Part-Time
General Administration		
Council	8	
Mayor's Office	2	
Housing Planner	1	
Zoning Inspector		1
Solicitor	2	
Court	5	1
Civil Service Commission		4
Plumbing and Housing Inspector	1	
Financial Control		
Auditor	3	
Treasurer	2	1
Grantsperson	1	
Health		
Health	4	—
Total	29	7

Source: City of Conneaut unpublished data.

that of Conneaut except for its eight urban renewal employees (see Table 2-179). In Springfield Township, in addition to the elected officials, the only general Government employee is the part-time secretary-treasurer. General Government employment for Ashtabula County, OH and Erie County, PA, is presented in Tables 2-180 and 2-181, respectively.

c) Employment Projections

2.291
General Government employment is estimated on a full-time equivalent basis because the extensive use of part-time employees and elected officials by local Governments in the Coastal Communities creates a need for a uniform and comparable measure. Projections of full-time equivalent general Government employment for the projection period under baseline conditions are made by applying 1975 estimates of full-time equivalent general Government employment per 1,000 population (refer to Table 2-182) to the baseline population projections. The projections of general Government employment for each local Government in the Coastal Communities are shown in Table 2-183. These projections assume that general Government employment per 1,000 population will remain constant throughout the projection period.

d) Operating Expenditures

2.292
Expenditures for general Government have generally been increasing for most local Governments in the Coastal Communities over the past five years in both current and constant dollar terms (refer to Tables 2-184 and 2-185). There is, however, considerable variation in expenditure patterns. For Conneaut and Springfield, with the exception of the 1971-1972 period, expenditures in constant dollar terms for general Government have been steadily increasing. Erie County's general Government expenditures have increased substantially (more than 200 percent) over the period. Ashtabula County's general Government expenditures for 1975 are not much higher than its 1970 amount, with expenditures averaging about $2.0 million for the period. The possible inclusion of expenditures for certain extraordinary or non-recurring items in the general Government category, along with possible inconsistencies in the reporting of expenditures by category in the financial reports may account for some of the yearly variations in constant dollar expenditures for certain local Governments. Estimates for general Government operating costs for the projection period are made by applying the 1975 operating cost per full-time equivalent employee from Table 2-182 to the baseline

Table 2-179

Ashtabula City General Government Employees -- 1977

Function/Department	Full-Time	Part-Time
General Administration		
City Manager	7	1
City Solicitor	3	
Housing and Community Planning	2	
Municipal Court	7	
Probation	3	
Legal Advisor	1	
Council		7
Urban Renewal	8	
Clerk of Council		1
Financial Control		
City Treasurer		1
City Auditor	4	1
Income Tax	4	
Purchasing	1	
Health		
Health Department	6	—
Total	46	11

Source: City of Ashtabula unpublished data.

Table 2-180

Ashtabula County General Government Employees -- 1977[1]

Function/Department	Full-Time	Part-Time
General Administration		
Recorders	7	
Planning Commission	5	
Western County Court	4	7
Jury Commissioners		2
Prosecutors	8	
Coroners	2	
Clerk of Courts	1	
Clerk of Courts Office	15	
Commissioners Office	23	
Board of Elections	10	
Eastern County Clerk	3	
Juvenile Court	4	
Regional Development	3	
Financial Administration		
Auditors	23	
Treasurers	8	
Auditor's Lock Boxes		3
Health		
Health Department	11	—
Total	127	12

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(1) Excludes corrections which is under the jurisdiction of the county sheriff (with 20 employees) and is included in the Law Enforcement section of this chapter.

Source: Ashtabula County unpublished data.

Table 2-181

Erie County General Government Employees -- 1977

Function/Department	Number of Employees
General Administration	
Commissioners	7
Voter Registration	11
Voting Machine Custodian	2
Assessment	22
Weights and Measures	2
Planning	12
Record of Deeds	11
Switchboard	3
Personnel	6
Register of Wills	11
Sheriff(1)	20
Coroner	4
Prothonotary	17
Clerk of Courts	9
Domestic Relations	3
Non-Support	16
District Attorney	17
Public Defender	18
Courts	35
District Justices (secretaries)	23
Employment and Training	
Financial Control	
County Treasurer	7
Tax Claim	7
County Controller	5
Personal Property Tax	4
Budget, Finance, Purchasing	5
Health	
Health Department	51
Corrections	
County Prison	59
Adult Probation	28
Juvenile Probation	27
Total	452

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(1) The Sheriff in Erie County is an officer of the court.

Source: Erie County, Personnel Department and Erie County Planning Commission.

Table 2-182

General Government Employment in the Coastal Communities--1976

	Employees Per 1000 Population(1)	Expenditure Per Employee (000$)
Ohio		
Ashtabula City	1.39	24.3
Ashtabula Township	0.22	44.4
Conneaut City(1)	0.78	20.3
Kingsville Township	0.26	25.4
N. Kingsville Village	0.72	23.0
Saybrook Township	0.33	27.7
Ashtabula County	0.95	15.1
Pennsylvania		
E. Springfield Borough	0.23	31.3
Fairview Borough	0.24	23.3
Fairview Township	0.43	17.6
Girard Borough	0.29	46.4
Girard Township	0.47	16.8
Lake City Borough	0.44	29.1
Millcreek Township	0.46	18.7
Platea Borough	0.00	35.4
Springfield Township	0.23	17.2
Erie County	1.64	46.7

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(1) Full-time equivalent.

Source: General Government Working Paper, Table 6.

Table 2-183

Projected Full-Time Equivalent General Government Employment in the Coastal Communities — 1980-1990

	1980	1985	1990
Ohio			
Ashtabula Township	1.74	1.80	1.87
Ashtabula City	32.60	31.41	30.09
Conneaut City	11.73	12.05	12.32
Kingsville Township	0.57	0.62	0.66
N. Kingsville Village	2.13	2.32	2.50
Saybrook Township	2.44	2.69	2.94
Ashtabula County	99.18	101.94	104.31
Pennsylvania			
E. Springfield Borough	0.15	0.17	0.18
Fairview Borough	0.53	0.58	0.64
Fairview Township	3.09	3.40	3.72
Girard Borough	0.84	0.92	0.99
Girard Township	1.72	1.88	2.03
Lake City Borough	1.08	1.18	1.28
Millcreek Township	19.00	19.76	20.98
Platea Borough	0.06	0.06	0.07
Springfield Township	0.63	0.69	0.74
Erie County	464.46	480.24	496.52

Source: General Government Working Paper, Table 8 and baseline population projections.

Table 2-184

Expenditures for General Government in the Coastal Communities -- 1970-1976 (Thousands of Dollars)

	1970	1976
Ohio		
Ashtabula City	$ 438.3	$ 878.5
Ashtabula Township	59.2	73.9
Conneaut City	108.3	249.3
Kingsville Township	5.7	14.9
N. Kingsville Village	N/A	47.8
Saybrook Township	26.2	65.5
Ashtabula County	1,330.4	1,559.0
Pennsylvania(1)		
E. Springfield Borough	2.2	4.0
Fairview Borough	9.0	11.9
Fairview Township	36.1	52.3
Girard Borough	31.2	39.7
Girard Township	21.1	28.7
Lake City Borough	16.0	31.8
Millcreek Township(2)	240.6	363.1
Platea Borough	2.2	1.9
Springfield Township	8.4	11.0
Erie County	5,861.3	20,773.9

---

(1) Pennsylvania estimates adjusted to include fringe benefits.

(2) Includes libraries.

Source: Financial Reports for Ohio counties, villages, cities, and townships, Office of the Ohio State Auditor; Local Government Financial Statistics, Pennsylvania Department of Community Affairs.

Table 2-185

Expenditures for General Government in the Coastal Communities -- 1970-1976 (Thousands of Dollars)(1)

	1970	1976
Ohio		
Ashtabula City	$ 642.9	$ 822.1
Ashtabula Township	87.0	68.1
Conneaut City	159.2	233.3
Kingsville Township	8.4	13.9
N. Kingsville Village	N/A	44.8
Saybrook Township	38.4	61.3
Ashtabula County	1,955.8	1,459.8
Pennsylvania[2]		
E. Springfield Borough	3.2	3.8
Fairview Borough	13.2	11.2
Fairview Township	53.1	48.9
Girard Borough	45.9	37.1
Girard Township	31.0	26.9
Lake City Borough	23.6	29.4
Millcreek Township	353.6	339.8
Platea Borough	N/A	1.8
Springfield Township	12.4	10.3
Erie County	8,616.1	20,773.8

N/A = Not Available.

(1) Constant dollar estimates are made by applying the implicit GNP deflator for state and local government expenditures to the current dollar amounts.

[2] Pennsylvania estimates adjusted to include fringe benefits.

Source: Office of the Ohio State Auditor, Financial Reports for Ohio counties, villages, cities, and townships, Office of the Ohio State Auditor; Local Government Financial Statistics, Pennsylvania Department of Community Affairs.

projections of full-time equivalent employment from Table 2-183. Table 2-186 shows the projected general Government operating expenditures for each local Government in the Coastal Communities. Expenditures for all local Governments are expected to grow slightly in constant dollar terms, with the exception of Ashtabula City where expenditures are projected to remain constant. Using the projection approach described above, Ashtabula City's general Government expenditures would decline because of the projected decline in the city's population. However, it was assumed that expenditures would not decline below current levels.

State and Local Tax Structure

a) Sources of State Tax Revenues

Ohio

2.293
In 1975, the State of Ohio collected $2.91 billion in tax revenues (see Table 2-187), a 27 percent increase (in constant 1975 dollars over the $2.29 billion collected in 1970). The major tax revenue source in Ohio is the State sales tax, which accounted for about one-third of total State tax revenues in 1975. In 1970, the sales tax accounted for nearly 40 percent of total State tax revenues. In 1972, Ohio adopted a personal income tax which now accounts for about 17 percent of total State tax revenues (refer to Figure 2-19). State taxes per capita in 1975 were $280. State tax revenues in Ohio by source are presented in Table 2-187.

Pennsylvania

2.294
State tax revenues in Pennsylvania in 1975 totaled $4.5 billion, which constitutes an increase of about 14 percent in constant dollars over the $3.93 billion collected in 1970. The State sales tax is the largest revenue source, accounting for about 29 percent of total State revenues. The personal income tax, which was adopted in 1971, now accounts for about 23 percent of total State tax revenues. State taxes per capita in 1975 were $379 (refer to Figure 2-20). Pennsylvania State tax revenues by source are shown in Table 2-188.

b) Projected State Tax Revenues

2.295
The Ohio and Pennsylvania projected tax revenues for the major State tax sources over the study period 1975-1990 are shown in Tables 2-189 and 2-190, respectively.

Table 2-186

Projected General Government Operating Expenditures in the Coastal Communities
(Thousands of 1975 Dollars)

	1980	1985	1990
Ohio			
Ashtabula City	$ 822.1	$ 822.1	$ 822.1
Ashtabula Township	77.3	79.9	83.0
Conneaut City	238.1	244.6	250.1
Kingsville Township	14.5	15.7	16.8
N. Kingsville Village	48.9	53.4	57.5
Saybrook Township	67.6	74.5	81.4
Ashtabula County	1,497.6	1,539.3	1,575.1
Pennsylvania			
E. Springfield Borough	4.7	5.3	5.6
Fairview Borough	12.3	13.5	14.9
Fairview Township	54.4	59.8	65.5
Girard Borough	39.0	42.7	45.9
Girard Township	28.9	31.6	34.1
Lake City Borough	31.4	34.3	37.2
Millcreek Township	355.3	369.5	392.3
Platea Borough	2.1	2.1	2.5
Springfield Township	10.8	11.9	12.7
Erie County	21,701.9	22,439.2	23,199.9

Source: Tables 2-182 and 2-183.

Table 2-187

State Tax Revenues in Ohio by Source
(Millions of 1975 Dollars(1)

Source of Tax Revenue	1970	Percent of Total Revenues	1975	Percent of Total Revenues
Business Taxes	$ 331.6	14.5%	$ 630.6	21.7%
Corporation Franchise	162.1	7.1	377.4	13.0
Public Utility Expense	88.9	3.9	174.7	6.0
Insurance	80.6	3.5	78.6	2.7
Personal Income Taxes (2)			485.1	16.7
Sales and Use Taxes	909.2	39.8	975.4	33.5
Motor Fuel Taxes (3)	476.8	20.9	373.7	12.8
Other Taxes	569.2	24.8	447.9	15.3
Cigarette	252.6	11.0	178.7	6.1
Alcoholic Beverage	95.2	4.2	71.8	2.5
Estate	27.4	1.2	29.8	1.0
Intangible Property	5.4	0.2	9.2	0.3
Severance	0.0	0.0	3.8	0.1
Horse Racing	21.7	0.9	20.5	0.7
Motor Vehicle License	166.8	7.3	134.0	4.6
Total	$2,286.8	100.0%	$2,912.7	100.0%

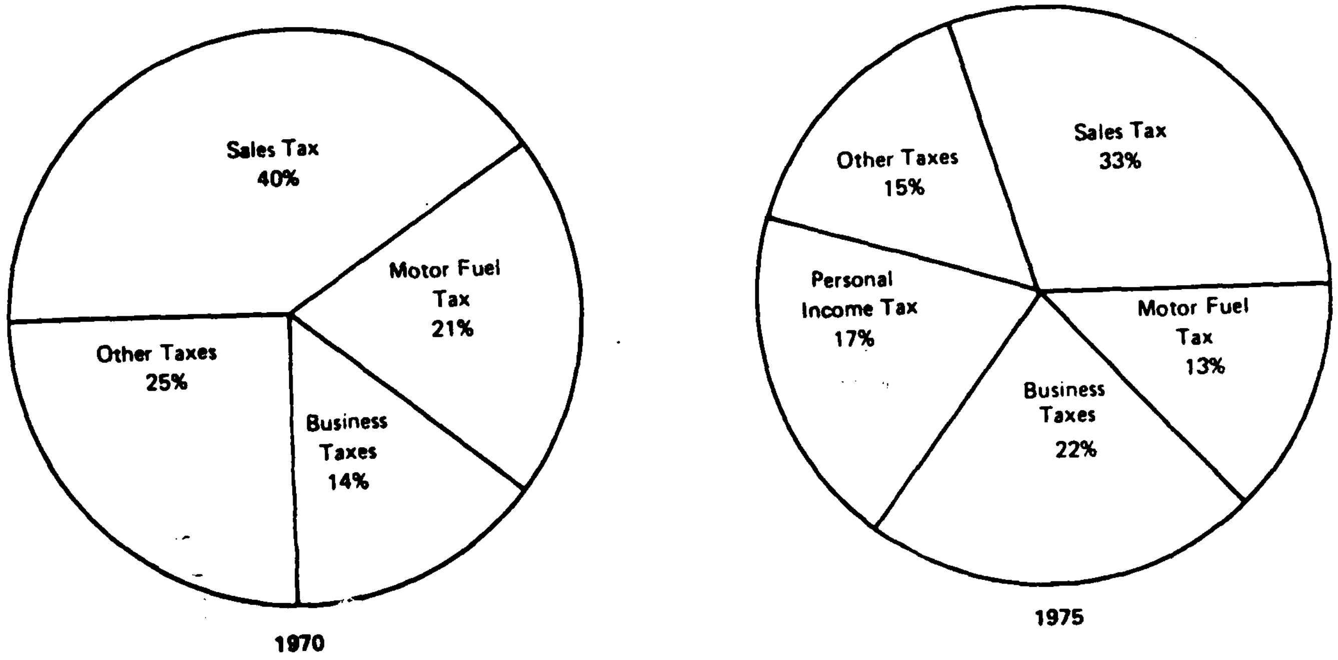
---

(1) Calendar years. Constant dollars estimated by applying deflator for state and local government contained in U.S. national income and product accounts.

(2) Tax became effective in 1972.

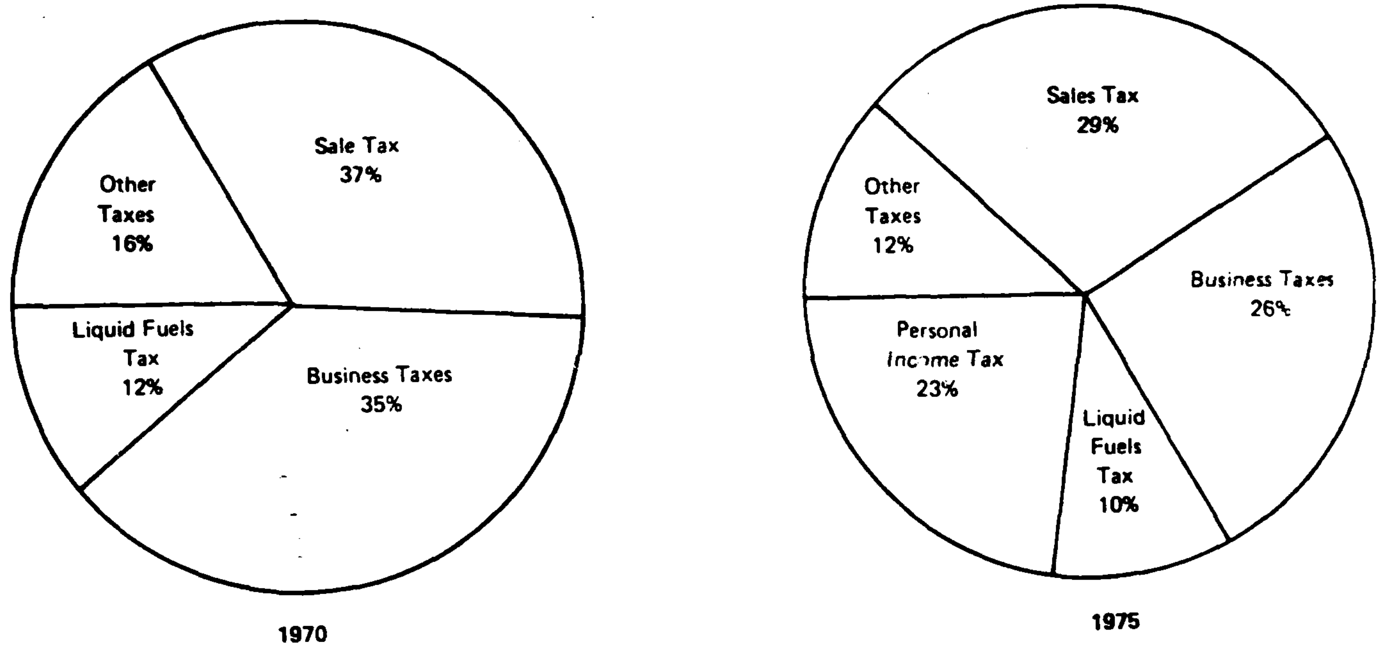
(3) Estimates based on fiscal year data.

Source: Ohio Department of Taxation.



Source: Table 2–187.

FIGURE 2–19 OHIO STATE TAX REVENUE BY SOURCE – 1970, 1975



Source: Table 2–188.

FIGURE 2–20 PENNSYLVANIA STATE TAX REVENUE BY SOURCE – 1970, 1975

Table 2-188

State Tax Revenues in Pennsylvania by Source (Millions of 1975 Dollars[1])

Source of Tax Revenue	1970	Percent of Total Revenues	1975	Percent of Total Revenues
Corporation Taxes	$1,360.3	34.6%	$1,182.8	26.3%
Net Income	840.6	21.4	600.1	13.3
Capital Stock and Franchise	180.5	4.6	183.3	4.1
Selective Business	339.2	8.6	399.4	8.9
Personal Income Taxes[2]			1,051.7	23.4
Sales and Use Taxes	1,466.1	37.3	1,298.1	28.9
Liquid Fuels Taxes[3]	491.2	12.5	444.8	9.9
Other Taxes	613.6	15.6	517.7	11.5
Cigarette	284.2	7.2	230.5	5.1
Alcoholic Beverages	135.6	3.5	104.4	2.3
Realty Transfer	44.7	1.1	48.2	1.1
Inheritance	148.4	3.8	134.0	3.0
Minor and Repealed	0.7	*	0.6	*
Total	$3,931.2	100.0%	$4,495.1	100.0%

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*Less than 0.1%.

[1] Calendar years. Constant dollars estimated by applying deflator for state and local government contained in U.S. national income and product accounts.

[2] Tax became effective in 1971.

[3] Estimates based on fiscal year data.

Source: Pennsylvania Department of Revenue.

Table 2-189

Ohio State Tax Revenue Projections -- 1975-1990
(Millions of 1975 Dollars)(1)

	1975(2)	1980	1985	1990
Sales Tax	$ 975	$ 996	$1,055	$1,116
Personal Income Tax	485	564	644	737
Corporation Income Tax	377	394	411	430
Liquid Fuels Tax	374	374	374	374
Other Taxes(3)	448	464	480	497
Total Taxes	$2,659(4)	$2,792	$2,964	$3,154

---

(1) Calendar year.

(2) Actual receipts.

(3) See Table 2-187 for items included in the category "other taxes."

(4) Does not agree with total on Table 2-187 since it excludes certain business taxes which are not being estimated in the impact analysis and therefore are not included in the baseline projections.

Source: Table 2-187 and Arthur D. Little, Inc. estimates.

Table 2-190

Pennsylvania State Tax Revenue Projections -- 1975-1990 (Millions of 1975 Dollars)(1)

	1975(2)	1980	1985	1990
Sales Tax	$1,298	$1,436	$1,469	$1,503
Personal Income Tax	1,052	1,080	1,108	1,136
Corporation Income Tax	600	615	624	647
Motor Fuel Tax	392	392	392	392
Other Taxes(3)	517	525	533	541
Total Taxes	$3,859(4)	$4,048	$4,126	$4,219

---

(1) Calendar year.

(2) Actual receipts.

(3) See Table 2-188 for items included in the category "other taxes."

(4) Does not agree with total on Table 2-188 since it excludes certain business taxes which are not being estimated in the impact analysis and therefore are not included in the baseline projections.

Source: Table 2-188 and Arthur D. Little, Inc. estimates.

c) Sources of Local Government and School District Revenues

2.296
Local Governments in Ohio and Pennsylvania receive revenues from local, State, and Federal sources. The major local revenue sources are the property tax and the income tax. Nearly all Federal revenues for local Governments in the Coastal Communities are received under the Federal Revenue Sharing Program. Federal Revenue Sharing Program receipts can be used to finance a variety of current operating expenses and thus have a tax rate stabilizing effect. Ohio local Governments receive a portion of certain State-collected tax revenues as well as State revenues for highway purposes. In Pennsylvania, State grants to local Governments are limited almost exclusively to programs for construction and maintenance of local roads and highways. In addition to local revenue sources, school districts receive revenues from State and Federal sources. Federal revenues have constituted a small portion of total revenues received by public schools. Federal programs are primarily categorical with revenues earmarked for specific purposes. A large portion of the Federal revenues are allocated to school lunch and milk programs. Other Federal programs relate to the education of culturally or economically disadvantaged students.

2.297
State subsidies to local school districts are major sources of school operating revenues in both States. Funding levels for State instructional grant programs and the specifics of the allocation formulas have become increasingly significant as local school costs have increased. Ohio State instructional subsidies are paid through the Basic Foundation Program. Supplementary categorical program funds are available for vocational education, special education, transportation of pupils, and programs for disadvantaged pupils. Since 1972-1973, State funding has been financed largely by the Ohio personal income tax and, since the 1975-1976 school year, distributed on the basis of the equal yield formula. The intent of the equal yield formula is to produce an equal sum of money (local and State combined) on a per pupil per mill basis for each qualifying school district. The formula guarantees each district a basic per pupil operating expenditure, thereby establishing a base for meeting educational standards across the State. Pennsylvania support of public schools is broken down into five basic areas including: basic instructional subsidy, 74.9 percent; rental subsidy, 8.6 percent, special education, 7.1 percent; transportation, 4.2 percent; and vocational education, other, 5.2 percent. The basic instructional subsidy is calculated for each school district on the basis of a formula which attempts to equalize differences in the relative wealth of school districts. Rental subsidies include payments for the service of

debts incurred for new school construction. Funds for special education are channeled to the Intermediate Unit which operates the special education programs in the Unit's three-county area. Transportation allowances primarily cover the purchase of new buses. The vocational education subsidy supports vocational programs in the general public high schools; State funds for separate vocational schools are distributed directly to the vocational school.

2.298
In Ohio, the financing of capital programs is strictly a local effort. There are no State funds available for construction or renovation of school facilities. Capital funds are raised through the issue of school bonds which must be approved by the voters in the school district. In Pennsylvania, bonds are issued by either the Pennsylvania Public School Building Authority or a similar authority established at the local level. The school district repays the issuing authority on the basis of a lease-rental arrangement; following settlement of the debt, the title of the school property is transferred to the school district. Second, State funds are available to subsidize the annual debt service payments (or rentals). The amount of reimbursement is determined by a formula which considers the school district's State aid ratio and the pupil capacity of the facility.

Ohio Local Study Area

2.299
The income tax is the major source of revenue for Conneaut. Revenues of over $625,000 from this tax accounted for about 40 percent of the city's total revenues in 1975. The tax rate has remained constant at one percent since 1968 when it increased from 0.8 percent. The property tax is the next most important revenue source, accounting for about one quarter of total revenues (refer to Table 2-191 and Figure 2-21). Of the $397,600 in property tax revenues collected by the City, $87,489 or about 22 percent comes from the tax on tangible personal property. Conneaut's property tax revenue increased by almost 95 percent between 1970 and 1975. The tax rate changed little over the period, but there were significant increases in the tax base. The property tax revenues as a percent of total revenues increased only slightly during the period. Conneaut's income tax revenues increase by 56 percent during the period, but declined as a percentage of total tax revenues. The major change in the revenue structure between 1970 and 1975 for Conneaut as well as for all other Coastal Communities was the addition of Federal revenue sharing as a revenue source. The Conneaut Area City School District's property tax revenues accounted for about one-half of its total revenues, with State aid accounting for most of the remainder. Sources of revenues for school districts within the Ohio Coastal Communities are presented in Table 2-192 and Figure 2-22.

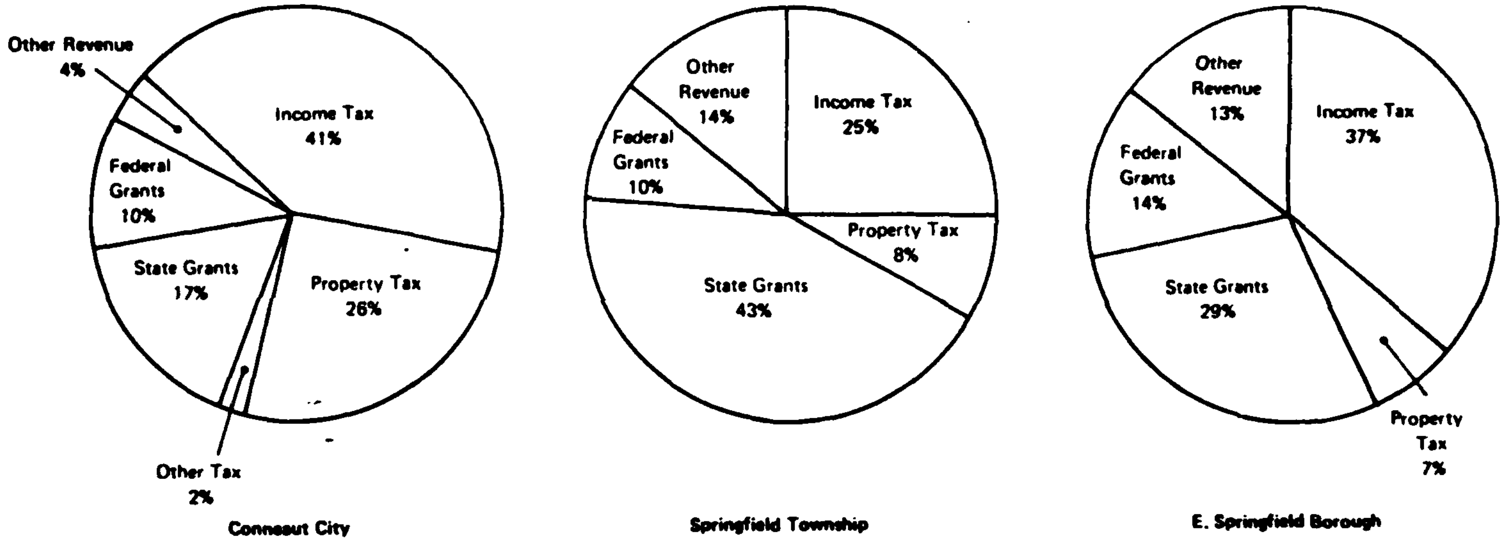
Table 2-191

Sources of Revenue for Conneaut City
(Thousands of Dollars)

	1970		1975	
	Revenues	% of Total Revenues	Revenues	% of Total Revenues
Property Tax	$ 204.6	23.3 %	$ 397.6	25.8 %
Income Tax	401.7	45.7	625.5	40.6
Other Tax	N/A	N/A	35.0	2.3
State Grants	243.6	27.7	262.0	17.0
Federal Grants	0.0	0.0	161.1	10.4
Other Revenue	29.5	3.3	60.8	3.9
	$ 879.4	100.0%	$1,542.0	100.0%

N/A = Not Available.

Source: 1970 Financial Report of Ohio Cities, Ohio Auditor of State.



Sources: Tables 2–191 and 2–196.

FIGURE 2–21 COMPARISON OF REVENUES BY SOURCE FOR MUNICIPALITIES IN THE LOCAL STUDY AREA – 1975

Table 2-192

Sources of Revenues of School Districts in Ohio Coastal Communities--1975 (Thousands of Dollars)

	Conneaut Area City School District	Buckeye Local School District	Ashtabula Area City School District
Property Tax	$ 1,848.3 (50.5)(1)	$ 3,459.4 (81.5)	$ 3,877.7 (50.9)
State Aid Basic Program	1,244.4 (34.0)	501.3 (11.8)	2,287.8 (30.0)
Other State Aid(2)	424.4 (11.6)	177.4 (4.2)	424.3 (5.6)
Federal Programs(3)	92.9 (2.5)	36.7 (0.9)	260.9 (3.4)
Other Revenue(4)	51.0 (1.4)	71.6 (1.7)	768.1 (10.1)
Total Revenue	3,661.0 (100.0%)	4,246.4 (100.0%)	7,618.8 (100.0%)

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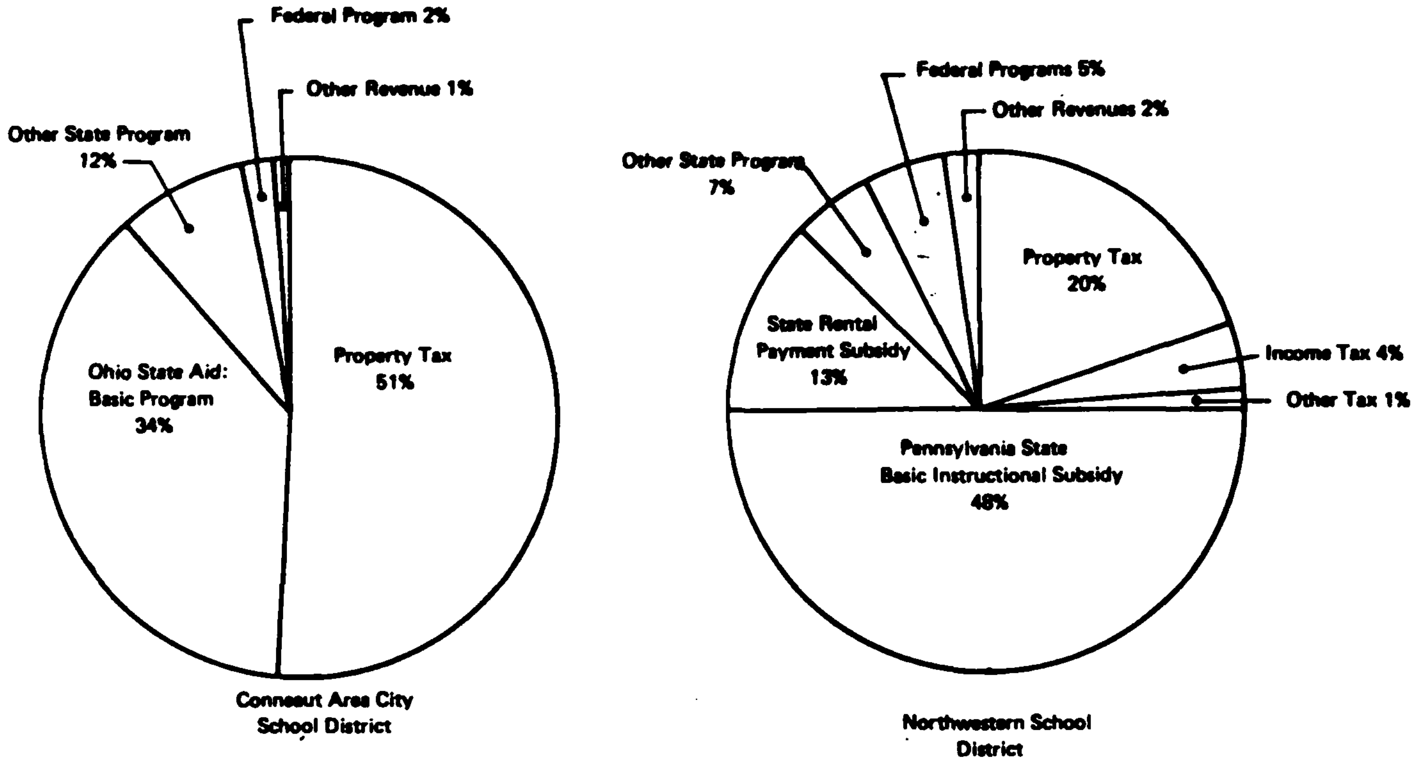
(1) Parentheses indicate percentage of total revenues.

(2) Includes bus purchase allowance.

(3) Excludes school lunch and milk programs.

(4) Includes tuitions, donations, rentals, sale of supplies, and transportation revenues.

Source: 1975 Financial Report, Ohio Schools, Ohio Auditor of State.



Conneaut Area City
School District

Northwestern School
District

Source: Tables 2–192 and 2–195.

FIGURE 2–22 COMPARISON OF SOURCES OF REVENUE OF SCHOOL DISTRICTS IN THE LOCAL STUDY AREA

Ohio Principal Study Area

2.300
For municipalities in the Coastal Communities, the income tax is the major revenue source, accounting for 41 percent of total revenue in Ashtabula City and 42 percent in North Kingsville. In townships, the property tax is the major revenue source. It accounts for about 62 percent of total revenues in Ashtabula and Saybrook Townships and 53 percent in Kingsville. For the Ashtabula County Government, property tax revenues account for 54 percent of total revenues (refer to Table 2-193). Property tax revenues account for 51 percent of total revenues in the Ashtabula Area City School District, and 81 percent in the Buckeye Local School District. This difference reflects the State's school aid formula which provides larger amounts of school aid to districts with relatively low levels of taxable property valuations per pupil. Since the Buckeye District has a sizable tax base (due to the presence of several large industrial corporations) relative to the other two districts, it receives substantially less State aid (refer to Table 2-192).

Pennsylvania Local Study Area

2.301
Personal income tax is the major tax revenue source for the two municipalities in the Pennsylvania Local Study Area. For East Springfield Borough, income tax revenues in 1975 accounted for 37 percent of total revenues or more than any other tax or nontax revenue source. For Springfield Township, income tax revenues of $27,055 accounted for nearly one-quarter of total revenues. The largest source of revenue for Springfield Township was State grants which accounted for nearly 43 percent of its total revenues as shown in Figure 2-21. The sources of revenue for municipalities in the Pennsylvania portion of the Local Study Area are presented in Table 2-194. Property tax revenues for Springfield Township increased by nearly 158 percent between 1970 and 1975, reflecting in part the increase in Springfield's property tax rate from one mill to two mills per dollar of assessed valuation in 1972. East Springfield Borough, whose rate has remained constant at 1.5 mills in 1970 had little increase in property tax revenues. There was no reassessment of property in either jurisdiction during this period. Both Springfield Township and East Springfield Borough increased their revenues from the income tax during the 1970-1975 period. In East Springfield, income tax revenues nearly doubled, while in Springfield Township, they increased by nearly 68 percent. There was no change in the income tax rate in either municipality during the period. For the one school district (Northwestern) in the Local Study Area, State subsidies are the principal revenue source, accounting for nearly half of the revenues (as shown in Table 2-195 and Figure 2-22).

Table 2-193

Sources of Revenue for Ohio Coastal Communities--1975
(Thousands of Dollars)

	Conneaut City	Kingsville Township	N. Kingsville Village	Ashtabula Township	Ashtabula City	Saybrook Township	Ashtabula County
Property Tax(1)	$ 397.6 (25.8)(2)	$ 42.1 (3.1)	$ 62.1 (23.1)	$ 576.2 (61.7)	$ 791.0 (19.7)	$ 269.8 (62.4)	$2,185.0 (53.8)
Income Tax	625.5 (40.6)	0 (0.0)	113.6 (42.3)	0 (0.0)	1,634.3 (40.8)	0 (0.0)	0 (0.0)
Other Tax	35.0 (2.3)	0 (0.0)	2.6 (1.0)	0 (0.0)	143.1 (3.6)	0 (0.0)	0 (0.0)
State Grants(3)	262.0 (17.0)	18.2 (23.0)	42.8 (16.0)	105.4 (11.3)	526.7 (13.1)	54.2 (12.5)	435.2 (10.7)
Federal Grants	161.1 (10.4)	9.6 (12.1)	16.0 (6.0)	84.1 (9.0)	445.7 (11.1)	35.4 (8.2)	338.4 (8.3)
Other Nontax Revenue(4)	60.8 (3.9)	9.4 (11.8)	31.2 (11.6)	168.2 (18.0)	469.0 (11.7)	72.9 (16.9)	1,104.7 (27.2)
Total	$1,542.0 (100%)	$ 79.3 (100%)	$ 268.3 (100%)	$ 933.9 (100%)	$4,009.8 (100%)	$ 432.3 (100%)	$4,063.3 (100%)

Note: For specification of items under "other tax" and "other revenue" refer to the Revenue Estimation Working Paper.

(1) Includes real estate, utility property and tangible personal property.

(2) Parentheses indicate percentage of total revenues.

(3) Includes distribution of state collected taxes. Refer to the Revenue Estimation Working Paper.

(4) Township estimates adjusted to exclude revenue sharing.

Source: Financial Reports of the Ohio State Auditor.

Table 2-194

Sources of Revenue for Municipalities in the Pennsylvania Local Study Area

	1970		1975	
	Revenues	% of Total Revenues	Revenues	% of Total Revenues
East Springfield Borough				
Property Tax	$ 1,061	8.7%	$ 1,214	6.6%
Income Tax	4,090	33.4	6,864	37.4
State Grants	7,043	57.6	5,373	29.3
Federal Grants	0	0.0	2.412	13.1
Other Nontax Revenue	35	0.3	2,499	13.6
Total	$ 12,229	100.0%	$ 18,362	100.0%
Springfield Township				
Property Tax	$ 3,553	3.4	$ 9,161	8.3
Income Tax	13,836	13.1	27,055	24.6
State Grants	41,648	39.5	47,245	42.9
Federal Grants	0	0.0	10,487	9.6
Other Nontax Revenue	46,376(1)	44.0	16,102	14.6
Total	$105,413	100.0%	$110,050	100.0%

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(1) Springfield reported receipts of $43,892 for fines and forfeits, an unusually high amount.

Source: Local Government Statistics, Pennsylvania Department of Community Affairs.

Table 2-195

Sources of Revenue for School Districts in the Pennsylvania Coastal Communities (Thousands of 1975 Dollars)

	Northwestern	Girard	Fairview	Millcreek
Real Estate Taxes	$ 771.0 (20.1)(1)	$1,342.0 (43.6)	$1,827.3 (48.7)	$ 6,450.6 (53.8)
Income Tax	138.5 (3.6)	178.1 (5.8)	425.1 (11.3)	1,066.8(2) (8.9)
Other Taxes	52.1 (1.4)	71.7 (2.3)	22.5 (0.6)	
State Basic Instructional Subsidy	1,812.4 (47.6)	1,041.8 (33.9)	928.4 (24.8)	3,081.7 (25.7)
State Rental Payment Subsidy(3)	489.8 (12.8)	211.7 (6.9)	234.2 (6.2)	614.7 (5.1)
Other State Programs(4)	289.0 (7.5)	109.5 (3.6)	114.3 (3.1)	391.0 (3.3)
Federal Programs	181.0 (4.7)	10.3 (0.3)	34.4 (0.9)	47.8 (0.4)
Other Revenues(5)	90.1 (2.4)	111.4 (3.6)	165.4 (4.4)	340.9 (2.8)
Total Revenue	$3,823.9 (100.0%)	$3,076.5 (100.0%)	$3,751.6 (100.0%)	$11,993.6 (100.0%)

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(1) Parentheses indicate percentage of total revenues.

(2) Total for both categories is $1,066.8.

(3) With the exception of the Girard School District, new school construction is financed by bonds issued by the Pennsylvania School Building Authority; Girard has a local authority for issuing bonds. In either case, the school district leases the building and makes annual lease-rental payments toward settlement of the debt. The State subsidizes the annual lease-rental payments.

(4) School transportation is the largest component.

(5) Includes delinquent taxes.

Source: School district budgets.

Northwestern School District's relatively large State subsidy reflects its relatively low tax base. The real estate tax is the next largest source, accounting for about 20 percent of total revenue. In the Northwestern School District, revenues from Federal programs are greater than those received in the other school districts, primarily because Northwestern has a relatively high number of pupils from families with incomes below the poverty level.

Pennsylvania Principal Study Area

2.302
The local income tax is the largest source of revenue for several local Governments in the Pennsylvania Coastal Communities. In Millcreek, Lake City, and Girard Township, the tax is the major revenue source accounting for 37 percent, 35 percent, and 40 percent of total revenues, respectively. Fairview Borough and Township and Erie County do not have an income tax. The property tax is the major revenue source in Fairview and Girard Boroughs accounting for 30 percent and 28 percent of total revenues, respectively. For the Erie County Government, property tax revenues account for more than half (53 percent) of total revenues. The revenue sources for coastal communities in Pennsylvania are presented in Table 2-196. State grants are a major revenue source for all local Governments in the area. State grants listed in Table 2-196 are limited to those made for highway purposes and reflect the importance of road maintenance and repair activities in these communities. For the school districts in the Pennsylvania Coastal Communities, the property tax is the major revenue source (refer to Table 2-195) accounting for 49 percent of total revenues in Fairview, 44 percent in Girard, and 54 percent in Millcreek. State instructional subsidies are the next highest revenue source. Differentiation among school districts in State subsidies in part reflects respective variations in the amounts of taxable property per district. Revenues from Federal programs and other State programs comprise relatively small percentages of total revenues. The three school districts in the Pennsylvania Coastal Communities are generally similar in the percentage of total revenues obtained from each source. However, they do differ from the Northwestern District which has a substantially higher share of total revenues obtained from Federal programs primarily due mostly to its relatively large number of pupils from families with incomes below the poverty level.

d) Projected Local Revenues

2.303
Estimates of projected revenues for local Governments in the Coastal Communities are presented for Ohio in Table 2-197 and Pennsylvania in

Table 2-196

Sources of Revenue for Coastal Communities in Pennsylvania--1975

	East Springfield Borough	Springfield Township	Girard Borough	Girard Township	Lake City Borough
Property Tax	$ 1,214 (6.6)(1)	$ 9,161 (8.3)	$ 63,702 (27.9)	$ 15,183 (8.0)	$ 48,319 (33.7)
Income Tax	6,864 (37.4)	27,055 (24.6)	59,019 (25.8)	75,292 (39.9)	50,909 (35.5)
Other Tax	0 (0.0)	0 (0.0)	7,186 (3.1)	0 (0.0)	5,710 (4.0)
State Grants(2)	5,373 (29.3)	47,245 (42.9)	17,337 (7.6)	43,657 (23.1)	13,769 (9.6)
Federal Grants(3)	2,412 (13.1)	10,487 (9.6)	21,700 (9.5)	21,277 (11.3)	16,648 (11.6)
Other Revenue(4)	2,499 (13.6)	16,102 (14.6)	59,757 (26.1)	33,362 (17.7)	8,074 (5.6)
Total	$18,362 (100.0%)	$110,050 (100.0%)	$228,701 (100.0%)	$188,771 (100.0%)	$143,429 (100.0%)

Table 2-196 (Continued)

	Platea Borough	Fairview Borough	Fairview Township	Millcreek Township	Erie County
Property Tax	$ 2,235 (11.3)	$21,666 (29.7)	$ 46,442 (20.5)	$ 851,554 (31.5)	$ 6,948,452 (53.2)
Income Tax	5,838 (29.6)	0 (0.0)	0 (0.0)	1,010,000 (37.3)	0 (0.0)
Other Tax	108 (0.5)	19,753 (27.0)	75,735 (33.3)	122,110 (4.5)	351,361(4) (2.7)
State Grants(2)	8,783 (44.5)	10,134 (13.9)	59,039 (26.0)	241,153 (8.9)	0(2) (0.0)
Federal Grants(3)	1,757 (8.9)	8,050 (11.0)	23,751 (10.5)	339,693 (12.6)	2,983,044 (22.8)
Other Revenue(4)	1,035 (5.2)	13,424 (18.4)	22,125 (9.7)	140,207 (5.2)	2,784,745 (21.3)
Total	$19,756 (100.0%)	$73,027 (100.0%)	$227,092 (100.0%)	$2,704,717 (100.0%)	$13,067,602 (100.0%)

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(1) Parentheses indicate percentage of total revenues.

(2) Highway Grants.

(3) Federal Revenue sharing.

(4) Personal Property Tax.

Note: For specification of items under "other tax" and "other revenue" refer to the Revenue Estimation Working Paper.

Source: Local Governmental Statistics, Pennsylvania Department of Community Affairs, 1975

Table 2-197

Projected Revenues of Local Governments in the Ohio Coastal Communities -- 1975-1990
(Thousands of 1975 Dollars)

	1975	1979	1981	1986	1990
Conneaut City					
Total Revenues	$1,542	$1,571	$1,587	$1,628	$1,657
Nonproperty Tax Revenues	1,144	1,166	1,178	1,209	1,230
Property Tax Revenues	398	405	409	419	427
Kingsville Township					
Total Revenues	$ 79	$ 86	$ 88	$ 96	$ 102
Nonproperty Tax Revenues	37	41	42	45	48
Property Tax Revenues	42	45	46	51	54
Ashtabula Township					
Total Revenues	$ 934	$ 963	$ 978	$1,015	$1,044
Nonproperty Tax Revenues	358	369	375	389	400
Property Tax Revenues	576	594	603	626	644
Ashtabula City					
Total Revenues	$4,009	$3,758	$3,704	$3,587	$3,445
Nonproperty Tax Revenues	3,218	2,967	2,913	2,796	2,654
Property Tax Revenues	791	791	791	791	791
Saybrook Township					
Total Revenues	$ 432	$ 468	$ 487	$ 535	$ 574
Nonproperty Tax Revenues	270	176	183	201	216
Property Tax Revenues	162	292	304	334	358
Ashtabula County					
Total Revenues	$4,063	$4,140	$4,182	$4,294	$4,373
Nonproperty Tax Revenues	1,918	1,954	1,974	2,027	2,065
Property Tax Revenues	2,145	2,186	2,208	2,267	2,308

Source: Table 2-196 and Arthur D. Little, Inc. estimates.

Table 2-198. These estimates were derived by increasing 1975 revenues by the projected rate of increase in baseline population. This approach assumes that expenditure requirements for local Government services will increase at the same rate as population. Estimates of revenues, by source, for each school district in the Coastal Communities are shown in Tables 2-199 and 2-200. Total revenues are assumed to equal baseline education expenditure requirements. Revenues from basic State school aid are estimated on the basis of the school aid formulas in each State. School district revenues from State and Federal categorical aid programs are estimated using 1975 revenues. Despite declining enrollments, revenues from categorical aid programs are assumed to remain constant because categorical funds are committed on a program unit basis rather than on a per pupil basis. Federal revenue estimates uniformly exclude lunch and milk subsidies. Ohio categorical aid includes special education, vocational education in the general public high school, auxiliary services to nonpublic schools, bus purchase, and programs for disadvantaged pupils. Pennsylvania categorical aid includes poverty provision payments, transportation, vocational education in the general public high school, health services, driver education, and miscellaneous State grants. "Other school district revenue" is assumed to remain constant at the level received by each school district in 1975. "Other revenue" in both Ohio and Pennsylvania may include tuition and other receipts from patrons, rental of school property, gifts, bequests, endowment earnings, sale of permanent improvements, etc. In Pennsylvania school districts, delinquent taxes for all levies collected in 1975 are included in the "other revenue" category. School district income tax revenues are assumed to increase by the same rate as population. Only Pennsylvania school districts receive rental or debt service subsidies from the State. Generally, the estimates of rental subsidies are based on the existing debt retirement schedules of each school district in the Pennsylvania Principal Study Area. With the exception of the Northwestern School District, the 1975 State subsidy (as a percentage of 1975 debt service paid by each school district) was applied to estimated annual rental payments toward the retirement of existing debt. In the Northwestern School District, the 1975 rental subsidy was unusually high due to settlement of a prepayment in the lease-rental schedule. According to the Northwestern School District officials, the level of State rental subsidy in the early to mid-1980's is expected to be approximately $350,000 annually.

e) Assessed Property Valuation

Ohio Local Study Area

2.304
Conneaut's tax base has been increasing at an average annual rate of 9.2 percent since 1970, which is relatively high compared to the

Table 2-198

Projected Revenues of Local Governments in the Pennsylvania Coastal Communities -- 1975-1990 (Thousands of 1975 Dollars)

	1975	1979	1981	1986	1990
Springfield Township					
Total Revenues	$ 110	$ 116	$ 119	$ 129	$ 136
Nonproperty Tax Revenues	101	106	109	119	125
Property Tax Revenues	9	10	10	10	11
Girard Township					
Total Revenues	$ 190	$ 199	$ 205	$ 223	$ 238
Nonproperty Tax Revenues	175	183	188	205	219
Property Tax Revenues	15	16	17	18	19
Fairview Township					
Total Revenues	$ 227	$ 246	$ 256	$ 281	$ 302
Nonproperty Tax Revenues	181	196	204	223	240
Property Tax Revenues	46	50	52	58	62
Millcreek Township					
Total Revenues	$ 2,705	$ 2,831	$ 2,887	$ 3,014	$ 3,162
Nonproperty Tax Revenues	1,853	1,940	1,978	2,065	2,167
Property Tax Revenues	852	891	909	949	995
Erie County					
Total Revenues	$13,068	$13,482	$13,679	$14,144	$14,526
Nonproperty Tax Revenues	6,119	6,313	6,406	6,623	6,802
Property Tax Revenues	6,949	7,169	7,273	7,521	7,724

Source: Table 2-196 and Arthur D. Little, Inc. estimates.

Table 2-199

Projected Revenues for School Districts by Source in the Ohio Coastal Communities -- 1975-1990
(Thousands of 1975 Dollars)

	1975	1981	1986	1990
Conneaut Area City Schools				
Property Tax	$1,848.3	$2,173.0	$1,865.1	$1,793.7
State Aid, Basic Program	1,244.0	1,112.7	1,067.6	1,051.0
Other State Aid	424.4	424.4	424.4	424.4
Federal Programs	92.9	92.9	92.9	92.9
Other Revenues	51.0	51.0	51.0	51.0
Total	$3,661.6	$3,854.0	$3,501.0	$3,413.0
Buckeye Local School District				
Property Tax	$3,459.4	$3,021.6	$2,682.8	$2,609.4
State Aid, Basic Program	501.3	440.7	387.5	377.9
Other State Aid	177.4	177.4	177.4	177.4
Federal Programs	36.7	36.7	36.7	36.7
Other Revenues	71.6	71.6	71.6	71.6
Total	$4,246.4	$3,748.0	$3,356.0	$3,273.0
Ashtabula Area City Schools				
Property Tax	$3,877.7	$4,181.2	$3,747.6	$3,637.0
State Aid, Basic Program	2,287.8	2,025.6	1,807.2	1,758.8
Other State Aid	424.3	424.3	424.3	424.3
Federal Programs	260.9	260.9	260.9	260.9
Other Revenues	768.1	73.0	73.0	73.0
Total	$7,618.8	$6,965.0	$6,313.0	$6,154.0

Source: Table 2-192 and Arthur D. Little, Inc. estimates.

Table 2-200

Projected Revenues for School Districts by Source in the Pennsylvania Coastal Communities — 1975-1990
(Thousands of 1975 Dollars)

	1975	1981	1986	1990
Millcreek				
Property Tax	$ 6,450.6	$ 5,458.6	$ 5,328.8	$ 3,667.1
Income Tax	1,066.8	1,139.0	1,189.6	1,247.3
Other Tax	--	--	--	--
State Basic Subsidy	3,081.7	2,613.6	2,350.9	2,387.3
State Rental Subsidy(1)	614.7	635.0	515.9	44.5
Other State Programs	391.1	391.1	391.1	391.1
Federal Programs	47.8	47.8	47.8	47.8
Other Revenues	340.9	340.9	340.9	340.9
Total	$11,993.6	$10,626.0	$10,165.0	$ 8,126.0
Girard				
Property Tax	$ 1,342.0	$ 1,050.6	$ 1,016.2	$ 1,037.3
Income Tax	178.1	197.6	232.3	249.2
Other Tax	71.7	78.1	85.4	91.6
State Basic Subsidy	1,041.8	915.8	871.2	900.0
State Rental Subsidy(1)	211.7	211.7	211.7	211.7
Other State Programs	109.5	109.5	109.5	109.5
Federal Programs	10.3	10.3	10.3	10.3
Other Revenues	111.4	111.4	111.4	111.4
Total	$ 3,076.5	$ 2,685.0	$ 2,648.0	$ 2,721.0

Table 2-200 (Continued)

	1975	1981	1986	1990
Fairview				
Property Tax	$ 1,827.3	$ 1,476.7	$ 1,315.2	$ 1,354.2
Income Tax	425.1	479.2	526.8	565.1
Other Tax	22.5	25.4	27.9	29.9
State Basic Subsidy	928.4	772.0	741.1	767.8
State Rental Subsidy	234.2	247.6	225.9	207.9
Other State Programs[1]	114.3	114.3	114.3	114.3
Federal Programs	34.4	34.4	34.4	34.4
Other Revenues	165.4	165.4	165.4	165.4
Total	$ 3,751.6	$ 3,315.0	$ 3,151.0	$ 3,239.0
Northwestern				
Property Tax	$ 771.0	$ 911.8	$ 912.9	$ 960.4
Income Tax	138.5	147.6	158.9	168.0
Other Tax	52.1	55.5	59.7	63.1
State Basic Subsidy	1,812.4	1,342.0	1,235.9	1,277.9
State Rental Subsidy	489.8	390.0	382.5	382.5
Other State Programs[1]	289.0	289.0	289.0	289.0
Federal Programs	181.0	181.0	181.0	181.0
Other Revenue	90.1	90.1	90.1	90.1
Total	$ 3,823.9	$ 3,407.0	$ 3,310.0	$ 3,412.0

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[1] Includes poverty-related programs, transportation, vocational education in the public high school, health and driver education.

Source: Table 2-195 and Arthur D. Little, Inc. estimates.

other local Governments in the Coastal Communities. Further, the Conneaut School District tax base increase of 9.5 percent per year was the highest of the three school districts in the Coastal Communities. On a per capita basis, the city of Conneaut's tax base is the lowest for the three school districts. Conneaut's real estate tax base consists primarily of residential property (71.2 percent). Data on the assessed valuation of taxable property in taxing jurisdictions in the Ohio Coastal Communities, assessed valuation of property per capita of local Governments and school districts, and assessed valuation by real estate type are presented in Tables 2-201, 2-202, and 2-203, respectively.

Ohio Principal Study Area

2.305

Kingsville Township and North Kingsville Village had the highest annual rates of increase in the tax base of the Coastal Communities between 1970 and 1976 (12.7 percent and 12.0 percent, respectively) (refer to Table 2-201). Among local Governments and school districts in the Ohio Coastal Communities, differences in relative wealth and taxing and spending capacity are evident from comparisons of assessed valuations and total revenues per capita. For example, Ashtabula Township had an assessed valuation of $13,917 per capita which was far larger than the amount for the other Ohio communities, and nearly four times the amount of neighboring Ashtabula City (refer to Table 2-202). Ashtabula Township's high valuation is attributable to the presence of several large industrial corporations, including Union Carbide Corporation (1976 tax of $912,067) and Rockwell International Corporation (1976 tax of $399,033). Thus, Ashtabula's total revenues per capita are much larger than those of all but one of the other jurisdictions in Ohio as shown in Table 2-204. Its revenues per capita are exceeded only by Ashtabula City because it has an income tax and a motor vehicle license tax, while Ashtabula Township does not. Conneaut's assessed valuation per capita ($4,653) is exceeded by those of Saybrook and Ashtabula Townships. The Buckeye Local School District has a significantly higher assessed valuation per capita ($8,705) than Ashtabula Area City District ($4,892) or the Conneaut Area City District ($4,436). The Buckeye District includes those portions of Ashtabula Township in which sizable amounts of industrial property are located, including Union Carbide. Buckeye's advantage in having a relatively large tax base is reflected in its higher revenues per capita. With its larger tax base, the Buckeye District receives relatively low levels of State aid because the Ohio State aid formula attempts to equalize differentials in assessed valuation per pupil (refer to Table 2-191). Nevertheless, the Buckeye District's total revenues are nearly twice the amount, on a per capita basis, as those of the other Ohio school districts, thus Buckeye has a lower property tax rate (refer to Table 2-204). The

Table 2-201

Assessed Valuation of Taxable Property in Taxing Jurisdictions in the Ohio Coastal Communities -- 1970-1976(1)

(Thousands of Dollars)

	1970	1971	1972	1973	1974	1975	1976	1970-1976 Average Annual Growth Rate (%)
Local Governments								
Conneaut City	$ 42,655	$ 43,476	$ 47,559	$ 51,355	$ 62,992	$ 68,402	$ 72,496	9.2
Kingsville Township	4,344	4,376	5,487	6,250	6,877	8,101	8,898	12.7
North Kingsville Village	6,396	6,788	8,508	9,564	10,670	12,337	12,653	12.0
Ashtabula Township	94,870	100,394	102,650	99,496	99,722	105,766	118,058	3.7
Ashtabula City	73,510	73,997	78,662	80,774	85,437	87,832	84,884	2.4
Saybrook Township	42,662	44,540	49,728	53,952	57,465	62,859	64,777	7.2
Ashtabula County	384,149	397,196	441,671	461,588	498,281	549,520	564,701	6.6
School Districts								
Conneaut Area City School District	44,896	45,783	50,739	54,827	66,828	73,645	77,557	9.5
Buckeye Local School District	106,274	112,448	118,184	117,143	119,227	130,577	143,155	5.1
Ashtabula Area City School District	125,271	128,773	140,036	147,160	156,541	165,885	165,249	4.7

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(1) Includes real estate, utility property, and tangible personal property.

Source: Ashtabula County Auditor.

Table 2-202

Assessed Property Valuation Per Capita by Local Governments and School Districts in the Ohio Coastal Communities--1975(1)

Local Governments	Assessed Valuation Per Capita
Conneaut City	$ 4,653
Ashtabula City	3,614
Ashtabula Township	13,917
Kingsville Township	4,051
N. Kingsville Village	4,569
Saybrook Township	9,382
Ashtabula County	5,387
School Districts	
Conneaut Area City School District	4,436
Ashtabula Area City School District	4,982
Buckeye Local School District	8,075

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(1) Includes real estate, utility property, and tangible personal property.

Source: Ashtabula County Auditor; Arthur D. Little, Inc. estimates.

Table 2-203

Assessed Valuation of Real Estate by Type in the Ohio Coastal Communities — 1975 (Thousands of Dollars)

	Residential	Commercial	Industrial	Agricultural	Total
Conneaut City	$ 26,621 (71.2)[1]	$ 4,615 (12.3)	$ 3,865 (10.3)	$ 2,328 (6.2)	$ 37,429 (100%)
Kingsville Township	3,025 (57.9)	760 (14.6)	0 (0.0)	1,436 (27.5)	5,221 (100%)
N. Kingsville Village	6,184 (73.4)	840 (10.0)	449 (5.3)	947 (11.3)	8,420 (100%)
Ashtabula Township	16,117 (53.1)	2,663 (8.8)	10,817 (35.7)	730 (2.4)	30,327 (100%)
Ashtabula City	33,094 (64.4)	12,628 (24.6)	5,634 (11.0)	0 (0.0)	51,356 (100%)
Saybrook Township	29,748 (72.0)	5,608 (13.6)	2,788 (6.7)	3,160 (7.7)	41,304 (100%)
Ashtabula County	188,790 (58.3)	41,684 (12.9)	27,307 (8.4)	65,872 (20.4)	323,653 (100%)

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(1) Parentheses indicate percent of total assessed valuation.

Source: Ashtabula County Auditor.

Table 2-204

Total Revenues Per Capita by Local Governments and School Districts in the Ohio Coastal Communities -- 1975

	Revenues Per Capita
Local Governments	
Conneaut City	$105.58
Kingsville Township	39.65
N. Kingsville Village	99.37
Ashtabula Township	122.88
Ashtabula City	179.82
Saybrook Township	64.52
Ashtabula County	31.19
School Districts	
Conneaut Area City	111.04
Buckeye Local	230.63
Ashtabula Area City	116.44

Source: Ashtabula County Auditor; Arthur D. Little, Inc. estimates

relatively large tax base of this district allows it to raise more total revenue from a lower tax effort than the other districts. North Kingsville Village has the largest percentage of its real estate valuation attributable to residential property: 73.4 percent. Ashtabula City has nearly 25 percent of its tax base as commercial property reflecting Ashtabula's importance as the central trade area of the County. Ashtabula Township has the largest amount of industrial property of the Coastal Communities in both absolute and relative terms -- $10.8 million or 36 percent of the Township's total valuation (refer to Table 2-203).

Pennsylvania Local Study Area

2.306
The local Governments and school districts in the Pennsylvania Local Study Area have a relatively smaller and slower-growing tax base than local Governments and school districts in the other Pennsylvania Coastal Communities. The assessed valuation of taxable real estate in East Springfield Borough and Springfield Township has been increasing at relatively low annual rates of 2.1 percent and 2.7 percent, respectively, over the past five years as shown in Table 2-205. The Northwestern School District's tax base has been increasing at an annual rate of 2.8 percent (the lowest rate of increase of the four school districts in the Pennsylvania Coastal Communities) and it also has the lowest assessed valuation per capita of the four districts (refer to Table 2-206). However, it has the second highest amount of revenue per capita of the four Pennsylvania districts because of its relatively large amount of revenue from State aid. Residential property comprises the largest portion of the tax base in the Pennsylvania Local Study Area -- about two-thirds of the total in East Springfield, and about one-half in Springfield Township. The importance of agriculture in the area is evident from the valuation of agricultural property which comprises 23.5 percent of the total tax base in East Springfield, and 28.7 percent in Springfield Township. Industrial property accounts for a negligible portion of the tax base as shown in Table 2-207.

Pennsylvania Principal Study Area

2.307
Assessed valuation per capita among local Governments and school districts in the Pennsylvania Coastal Communities ranges from a low of $1,283 in Platea to a high of $3,802 in Fairview Township. Fairview Township and the Fairview School District also have the highest assessed valuation per capita of $3,802 and $3,342, respectively, reflecting the relatively high value of the new housing being constructed in that area. Fairview Township had the largest annual rate of increase (5.9 percent) in assessed valuation during the past

Table 2-205

Assessed Valuation of Taxable Real Estate in Local Governments and School Districts in the Pennsylvania Coastal Communities -- 1970-1975 (Thousands of Dollars)

	1970	1971	1972	1973	1974	1975	1970-1975 Average Annual Growth Rate (%)
Local Governments							
East Springfield Borough	$ 744	$ 753	$ 799	$ 811	$ 829	$ 827	2.1
Springfield Township	3,784	3,797	3,949	4,037	4,248	4,319	2.7
Girard Borough	5,364	6,662	6,860	5,781	5,876	5,938	2.1
Girard Township	5,992	6,238	6,420	6,820	7,249	7,637	5.0
Fairview Borough	3,157	4,540	4,677	3,504	3,590	3,696	3.2
Fairview Township	18,567	19,532	20,757	22,062	23,725	24,710	5.9
Millcreek Township	91,994	95,790	99,817	105,064	111,313	116,325	4.8
Erie County	489,557	501,267	517,799	536,584	556,562	571,413	3.1
School Districts							
Northwestern	11,267	12,522	12,872	13,118	12,545	12,912	2.8
Girard	16,267	17,876	17,739	17,138	17,803	18,484	2.4
Fairview	21,724	24,072	25,434	25,566	27,315	28,406	5.5
Millcreek	91,994	95,790	99,817	105,064	111,313	116,325	4.8

Source: Local Government Statistics, Pennsylvania Department of Community Affairs.

Table 2-206

Assessed Valuation of Taxable Real Estate Per Capita by Local Governments and School Districts in the Pennsylvania Coastal Communities -- 1975

	Assessed Valuation Per Capita
Local Governments	
E. Springfield Borough	$1,504
Springfield Township	1,630
Girard Borough	2,179
Girard Township	2,223
Lake City Borough	2,134
Platea Borough	1,283
Fairview Borough	1,848
Fairview Township	3,802
Millcreek Township	2,983
Erie County	2,103
School Districts	
Northwestern	1,316
Girard	2,199
Fairview	3,342
Millcreek	2,983

Source: Local Government Statistics, Pennsylvania Department of Community Affairs, Arthur D. Little, Inc. estimates.

Table 2-207

Assessed Real Estate Valuations of Local Governments by Type of Property in the Pennsylvania Coastal Communities -- 1975
(Thousands of Dollars)

	Residential	Commercial	Industrial	Agricultural	Other	Total(1)
East Springfield Borough	$ 554.8 (66.9)(2)	$ 63.5 (7.7)	$ 0	$ 195.1 (23.5)	$ 16.1 (1.9)	$ 829.5 (100.0)
Springfield Township	2,143.1 (49.6)	510.1 (11.8)	74.7 (1.7)	1,241.4 (28.7)	350.0 (8.1)	4,319.4 (100.0)
Girard Borough	4,105.8 (69.1)	952.1 (16.0)	661.6 (11.1)	77.1 (1.3)	141.7 (2.4)	5,938.3 (100.0)
Girard Township	4,262.4 (55.7)	913.5 (11.9)	120.3 (1.6)	1,840.0 (24.1)	514.2 (6.7)	7,650.4 (100.0)
Lake City Borough	2,866.7 (58.4)	459.7 (9.4)	1,441.4 (29.4)	16.7 (0.3)	123.4 (2.5)	4,907.9 (100.0)
Platea Borough	260.0 (57.9)	26.9 (6.0)	0	140.6 (31.3)	21.8 (4.9)	449.2 (100.0)
Fairview Borough	2,944.0 (79.5)	570.2 (15.4)	13.4 (0.4)	36.6 (1.0)	138.2 (3.7)	3,702.4 (100.0)
Fairview Township	17,403.9 (70.4)	2,078.2 (8.4)	1,484.3 (6.0)	2,002.0 (8.1)	1,741.5 (7.0)	24,709.8 (100.0)
Millcreek Township	79,905.8 (68.4)	24,897.2 (21.3)	5,828.3 (5.0)	2,576.9 (2.2)	3,621.1 (3.1)	116,829.3 (100.0)

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(1) Details may not add to totals because of rounding.

(2) Parentheses indicate percentage of total valuation.

Source: Pennsylvania State Tax Equalization Board.

five years of any local Government in the Pennsylvania Coastal Communities (refer to Table 2-205). Similarly, the Fairview School District showed the largest annual increase (5.5 percent) in the size of its tax base of the four school districts serving the Pennsylvania Coastal Communities. These increases reflect the substantial amount of residential construction that took place during the period. The Fairview School District also had the highest amount of revenue per capita ($441.36) of the four school districts (refer to Table 2-208). Fairview Township's revenues per capita are relatively low in part because it does not have an income tax. Unlike the other school districts where the local Governments and school district share the revenues from the one percent income tax, Fairview Borough and Township receive no revenue from this source and the school district receives all the revenue from the income tax. In Millcreek Township, commercial property accounts for about 21 percent of the total tax base, which is the largest percentage for any local Government in the Coastal Communities. Lake City has the largest share of its tax base in industrial property (29.4 percent) and Platea has the largest share of its tax base devoted to agricultural use (31.3 percent) as shown in Table 2-207.

f) Projected Assessed Valuations

2.308
Assessed property valuations for local Governments and school districts in the Coastal Communities were estimated for selected years of the projection period in the following manner:

> For most jurisdictions in the Coastal Communities, assessed valuation were projected by applying the projected rates of population growth to the 1975 assessed valuations.
>
> For the taxing jurisdictions in the Coastal Communities with relatively large amounts of commercial and industrial property, (Ashtabula Townships, Conneaut City, Buckeye School District, Ashtabula School District, Millcreek Township and Millcreek School District) assessed valuations were projected by applying the projected rates of population growth to the valuation of residential property and holding the commercial and industrial valuations constant at 1975 levels. This approach was used to avoid overstating the expected future growth in the commercial and industrial tax base that would result if the valuation of this property were increased by the projected population growth rate.

Projections of Assessed Valuation of Taxable property in taxing jurisdictions within the Ohio and Pennsylvania coastal communities are shown in Tables 2-209 and 2-210, respectively.

Table 2-208

Revenues Per Capita by Local Governments and School Districts in the Pennsylvania Coastal Communities -- 1975

	Revenue Per Capita
Local Governments	
E. Springfield	$ 33.88
Springfield Township	41.53
Girard Borough	83.93
Girard Township	81.28
Lake City Borough	62.36
Platea Borough	62.83
Fairview Borough	36.51
Fairview Township	34.94
Millcreek Township	69.35
Erie County	48.10
School Districts	
Northwestern	389.70
Girard	365.88
Fairview	441.36
Millcreek	307.52

Source: Local Government Statistics, Pennslyvania Department of Community Affairs.

Table 2-209

Projections of Assessed Valuation of Taxable Property in Taxing Jurisdictions in the Ohio Coastal Communities -- 1975-1990[1]
(Thousands of 1975 Dollars)

	1975	1979	1981	1986	1990
Local Governments					
Conneaut County	$ 68,402	$ 70,479	$ 71,330	$ 72,957	$ 74,286
Kingsville Township	8,101	8,714	9,026	9,804	10,427
N. Kingsville Village	12,337	13,275	13,748	14,928	15,882
Ashtabula Township	105,766	106,356	106,655	107,394	107,989
Ashtabula City	87,832	87,832	87,832	87,832	87,832
Saybrook Township	62,859	68,057	70,780	77,821	83,500
Ashtabula County	564,701	573,150	577,958	594,013	605,059
School Districts					
Conneaut Area City	73,645	75,882	76,798	77,716	79,980
Buckeye Local	130,577	130,968	131,180	131,699	131,920
Ashtabula Area City	165,885	166,410	166,704	167,492	168,017

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(1) Includes real estate, utility property, and tangible personal property.

Source: Ashtabula County Auditor; Arthur D. Little, Inc. estimates.

Table 2-210

Projections of Assessed Valuation of Taxable Property in Taxing Jurisdictions in the Pennsylvania Coastal Communities -- 1975-1990

(Thousands of 1975 Dollars)

	1975	1979	1981	1986	1990
Local Governments					
E. Springfield Borough	$ 827	$ 925	$ 999	$ 1,112	$ 1,203
Springfield Township	4,319	4,450	4,562	4,954	5,216
Girard Borough	5,938	6,244	6,435	7,015	7,483
Girard Township	7,637	8,030	8,276	9,020	9,621
Lake City Borough	4,909	5,163	5,321	5,801	6,189
Platea Borough	449	500	525	589	642
Fairview Borough	3,696	3,939	4,404	6,039	6,480
Fairview Township	24,710	26,784	27,860	30,622	32,849
Millcreek Township	116,325	120,577	122,297	125,982	130,352
Erie County	571,413	589,490	598,090	618,437	635,148
School Districts					
Northwestern	12,912	13,424	13,759	14,813	15,660
Girard	18,484	19,522	20,151	22,042	23,639
Fairview	28,406	30,788	32,025	35,203	37,765
Millcreek	116,325	120,577	122,207	125,982	130,352

Source: Local government statistics, Pennsylvania Department of Community Affairs; Arthur D. Little, Inc. estimates.

g) Property Tax Rates

Ohio Local Study Area

2.309
The tax rates of Conneaut City and the Conneaut Area City School District declined between 1970 and 1976. This is due in part to an increase in the tax base at a greater rate than spending increases, and the reluctance of voters to approve tax rate increases for higher capital and operating expenditures. The need to obtain voter approval for increases in tax rates is the major obstacle to raising tax rates in Conneaut, as well as the other Ohio Coastal Communities. Data on property tax rates for taxing jurisdictions within the coastal communities of Ohio are presented in Table 2-211.

Ohio Principal Study Area

2.310
Generally, property tax rates of local Governments and school districts in the Ohio Principal Study Area have not changed significantly between 1970 and 1975 (refer to Table 2-211). Ashtabula City has the highest tax rate for local Governments in the area of $11.115, which is more than twice the Conneaut rate. As in Pennsylvania, the school district property tax rates are substantially higher than those of local Governments.

Pennsylvania Local Study Area

2.311
Tax rates for the two municipalities in the Pennsylvania Local Study Area are the lowest of all the Pennsylvania Coastal Communities (see Table 2-212). East Springfield's rate of $1.50 remained constant between 1970 and 1976. Springfield Township's rate doubled in 1972, rising from $1.00 per thousand to $2.00 per thousand. These low rates reflect the low level of municipal services required by the small rural population in the area. Road maintenance and repair is the major municipal function financed by these municipalities. Tax rates of the Northwestern School District have increased rapidly during the period, reflecting the impact of inflation and the construction costs of new schools recently built and concomitant debt service costs. Property tax rates for taxing jurisdiction in the coastal communities in Pennsylvania are presented in Table 2-213.

Pennsylvania Principal Study Area

2.312
Three municipalities, Fairview Borough, Girard Township, and Platea Borough had no change in property tax rates between 1970 and 1976.

Table 2-211

Property Tax Rates for Taxing Jurisdictions in the Coastal Communities in Ashtabula County -- 1970-1976

(Dollars Per Thousand of Assessed *Valuation*)

Local Governments	1970	1971	1972	1973	1974	1975	1976
Conneaut City	$ 5.680	$ 5.680	$ 5.980	$ 5.780	$ 5.680	$ 5.340	$ 5.300
Kingsville Township	5.080	5.180	4.880	4.680	5.680	5.330	5.020
N. Kingsville Village	3.780	4.780	4.080	4.380	4.980	4.130	4.320
Ashtabula Township	3.380	3.380	4.120	3.880	4.880	4.840	4.840
Ashtabula City	11.865	11.665	11.865	11.565	11.115	11.115	11.115
Saybrook	3.880	3.880	3.880	4.830	5.380	4.320	4.320
Ashtabula County	3.920	4.220	4.120	4.120	4.620	4.410	4.510
School Districts							
Conneaut Area City	33.700	33.700	31.400	29.800	28.900	17.790	27.790
Buckeye Local	27.300	27.150	25.750	29.450	29.350	27.650	27.520
Ashtabula Area City	30.100	29.100	28.200	27.400	27.500	29.610	29.710

Note: Comparison by property tax rates between local governments in Ohio and Pennsylvania may be misleading because of differences in assessment ratios. For an explanation of assessment ratios, refer to the Revenue Estimation Working Paper.

Source: Ashtabula County Treasurer.

Table 2-212

Property Tax Rates for Taxing Jurisdictions in the Pennsylvania Coastal Communities -- 1970-1976
(Dollars Per Thousand of Assessed Valuation)

Local Governments	1970	1971	1972	1973	1974	1975	1976
E. Springfield Borough	$ 1.50	$ 1.50	$ 1.50	$ 1.50	$ 1.50	$ 1.50	$ 1.50
Springfield Township	1.00	1.00	2.00	2.00	2.00	2.00	2.00
Girard Borough	8.00	11.00	11.00	11.00	11.00	11.00	13.00
Girard Township	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Lake City Borough	8.00	9.50	9.50	9.50	10.00	10.00	12.00
Platea Borough	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Fairview Borough	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Fairview Township	2.00	2.00	2.00	2.00	2.00	2.00	4.00
Millcreek Township	7.00	8.50	8.50	7.50	7.50	7.50	10.50
Erie County	10.50	10.50	12.50	12.50	12.50	12.50	15.00
School Districts							
Northwestern	32.00	49.00	57.50	61.50	63.00	63.00	63.00
Girard	40.00	48.00	64.00	64.00	77.00	77.00	77.00
Fairview	43.00	59.00	59.00	59.00	69.00	69.00	69.00
Millcreek	47.50	53.50	54.00	55.00	55.00	58.50	61.50

Source: Erie County Assessors Office.

Table 2-213

Projected Property Tax Rates in the Coastal Communities
(1975 Dollars per Thousand of Assessed Valuation)

	1975	1979	1981	1986	1990
Ohio					
Local Governments					
Conneaut City	$ 5.34	$ 5.70	$ 5.70	$ 5.70	$ 5.70
Kingsville Township	5.33	5.20	5.20	5.20	5.20
Ashtabula Township	4.84	5.60	5.70	5.80	6.00
Ashtabula City	11.11	9.00	9.00	9.00	9.00
Saybrook Township	4.32	4.30	4.30	4.30	4.30
Ashtabula County	4.41	3.80	3.80	3.80	3.80
School Districts					
Conneaut Area City School District	$27.79	$30.30	$28.30	$23.70	$22.40
Buckeye Local School District	27.65	25.40	23.00	20.40	19.80
Ashtabula Area City School District	29.61	28.10	25.10	22.40	21.60
Pennsylvania					
Local Governments					
Springfield Township	$ 2.00	$ 2.20	$ 2.20	$ 2.20	$ 2.20
Girard Township	2.00	2.00	2.00	2.00	2.00
Fairview Township	2.00	1.90	1.90	1.90	1.90
Millcreek Township	7.50	7.40	7.40	7.50	7.60
Erie County	12.50	12.20	12.20	12.20	12.20
School Districts					
Northwestern	$63.00	$69.50	$66.10	$61.60	$61.10
Girard	77.00	56.30	52.20	46.10	43.90
Fairview	69.00	49.20	46.10	37.40	35.90
Millcreek	58.50	49.10	44.70	41.90	28.10

Source: Tables 2-199, 2-200, 2-209, 2-210.

The school districts serving the four Coastal Communities all had substantial property tax rate increases. These rate increases reflect the failure of the property tax base to increase at a rate sufficient to keep pace with rising operating expenditures resulting from inflation and from increased debt service costs resulting from recent school building construction. The Girard School District's property tax rate of $77.00 is the highest rate for any taxing jurisdiction in the three-county area (refer to Table 2-212).

Projected Property Tax Rates

2.313
Property tax rates for local Governments and school districts in the Coastal Communities are derived by dividing property tax revenue requirements (refer to Tables 2-199 and 2-201) by the projected baseline assessed valuation (Tables 2-209 and 2-211). For most local Governments in the Coastal Communities the projected rates do not vary significantly from the 1975 rate. School district property tax rates are expected to decline, reflecting the probable decline in enrollment and expenditures. Projected property tax rates for each of the coastal communities are presented in Table 2-213.

h) Indebtedness

2.314
School districts in the Ohio Coastal Communities have relatively low debt levels (compared to the Pennsylvania districts) reflecting the low levels of school construction in recent years. The Buckeye Local School District will be debt free by 1981, assuming no additional debt is incurred. The Conneaut Area City and Buckeye Local School Districts each requested, but were denied (June 1977), voter approval for a tax millage increase to finance the construction of new facilities. The indebtedness of local Governments and school districts in the Ohio Coastal Communities for 1976 is shown in Table 2-214. In the Ohio Coastal Communities, Ashtabula City has the highest amount of outstanding debt $3.8 million, or about $156 per capita. Ashtabula's debt includes $2.1 million for urban renewal project notes and $1.5 million in sewer system general obligation bonds. Conneaut's debt of $1.5 million ($102.25 per capita) consists of nearly $600,000 in sewer system general obligation bonds and notes, over $290,000 in waterworks general obligation bonds and notes, and over $300,000 in transportation general obligation bonds. The largest item under North Kingsville's debt of $528,000 is $389,000 under a recreation revenue bond. Local Governments in the Pennsylvania Coastal Communities have relatively low amounts of outstanding debt as shown in Table 2-215. Four municipalities have no outstanding debt. The only municipality that has a significant amount of debt outstanding is Millcreek Township, with a debt of $4.2 million or roughly $100

Table 2-214

Indebtedness of Local Governments and School Districts in the Ohio Coastal Communities -- 1976

(Thousands of Dollars)

Local Governments	Total Debt Outstanding[1]	Debt Per Capita
Conneaut City	$ 1,510.2	$ 102.25
Kingsville Township	0	0
N. Kingsville Village	528.0	192.00
Ashtabula City	3,763.7	155.99
Ashtabula Township	0	0
Saybrook Township	57.0	8.34
Ashtabula County	4,654.0	45.42
School Districts		
Conneaut Area City	1,447.0	86.75
Buckeye Local	574.0	38.19
Ashtabula Area City	626.0	18.78

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(1) Includes principal on bonds and notes as of December 31, 1976.

Source: Annual Audit and Financial Reports; Arthur D. Little, Inc. estimates.

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Table 2-215

Indebtedness of Local Governments and School Districts in the Pennsylvania Coastal Communities -- 1976

(Thousands of Dollars)

Local Governments	Total Debt Outstanding(1)	Debt Per Capita
E. Springfield Borough	$ 0	$ 0
Springfield Township	0	0
Girard Borough	109.2	39.57
Girard Township	0	0
Lake City Borough	15.5	6.66
Platea Borough	N/A	N/A
Fairview Borough	2.9	1.42
Fairview Township(2)	0	0
Millcreek Township	4,248.4	107.69
Erie County	9,886.9	36.11
School Districts		
Northwestern	7,546.3	769.25
Girard	6,661.4	792.08
Fairview	9,080.6	1,068.1
Millcreek	18,764.5	481.14

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(1) Include principal interest on bonds and notes as of December 31, 1976.

(2) The township in 1976 guaranteed a $70,000 bond anticipation note of the Township Sewer Authority. The rate is payable out of the proceeds of a bond issue of the authority to be issued on or before May 1, 1979.

N/A = Not Available.

Source: Annual Audit and Financial Reports; Arthur D. Little, Inc. estimates.

per capita. Most of Millcreek's debt ($3.97 million) consists of its share of sewer revenue bond principal on the lease rental debt. (Debt consisting of annual rental payments to the State for the construction of local facilities financed from State funds) of the municipal sewer authority. Girard Borough's debt of $109,200 or $39.57 per capital consists almost entirely of a bond issue for the construction of a municipal building. School districts in the Pennsylvania Coastal Communities have large amounts of outstanding debt compared to local Governments and compared to school districts in the Ohio Coastal Communities. The Fairview School District has the highest debt outstanding: $9.1 million, or over $1,000 per capita. The relatively high indebtedness of the Pennsylvania school districts reflects school construction in recent years.

i) State Taxes

Sales Tax

Ohio

2.315

The State of Ohio levies a four percent sales tax, inclusive of the rental of tangible personal property and hotel rooms by transient guest. The rate has remained at four percent since 1967. Major exemptions from the sales tax include food for human consumption off the premises where sold, motor fuel, gas, water and steam, prescription drugs, cigarettes, and certain "direct use" exemptions for items used in business. These direct use exemptions include: material incorporated as a part of tangible personal property produced for sale by manufacturing, processing, assembling, or refining; material used or consumed directly in production of tangible personal property by manufacturing, processing, refining, mining, exploring, or agriculture, and tangible property used directly in rendering a public utility services. Tangible personal property used in certified air, noise, or water pollution control facilities is also exempt from the tax. Recent legislation exempts equipment and material used in the transformation or conversion of raw coal to coke. This exemption will apply mainly to manufacturers who have facilities to convert coal into coke for their own use.

Pennsylvania

2.316

The retail sales tax rate in Pennsylvania is currently six percent. Since its enactment at one percent in 151, the rate has increased four times as follows: three percent in 1957, four percent in 1960, five percent in 1964, and six percent in 1968. Certain services such as the alteration, cleaning, or repair of tangible personal property are subject to the tax. The occupancy of a hotel or motel room for a period of less than 30 days is also taxed. Major exemptions include

food (for consumption off the premises where sold), coal, water, most clothing, drugs (or medical supplies), cigarettes, gasoline, Bibles and religious articles. Machinery, equipment, parts and supplies consumed directly in manufacturing personal property are not subject to the tax. Despite the higher sales tax rate in Pennsylvania, the actual sales tax burden is higher in Ohio, due in part to the inclusion of clothing in its sales tax base. For example, the U. S. Internal Revenue Service estimates that a family of four with an income between $14,000 and $15,000 would pay $131 in sales taxes per year in Ohio and $122 in Pennsylvania.

Personal Income Tax

Ohio
2.317
The State of Ohio imposes a graduated income tax upon Ohio residents and on nonresidents who earn or receive income in Ohio. The tax is based upon Federal Adjusted Gross Income as reported on the Federal income tax return, with certain adjustments allowed under Ohio law. Personal exemptions of $650 are allowed for the taxpayer, spouse, and each dependent. Special tax credits have been enacted for senior citizens and families with two working spouses. The tax rates are as follows:

Ohio Taxable Income	Tax
0-$ 5,000	1/2 percent of Ohio Taxable Income
$5,000-$10,000	$25 + 1 percent of excess over $5,000
$10,000-$15,000	$75 + 2 percent of excess over $10,000
$15,000-$20,000	$175 + 2-1/2 percent of excess over $15,000
$20,000-$40,000	$300 + 3 percent of excess over $20,000
Over $40,000	$900 + 3-1/2 percent of excess over $40,000

These rates have not changed since the enactment of the legislation in 1971. Ohio has reciprocity agreements with the five surrounding States so that an individual whose income consists solely of compensation from any of the States need only file a tax return with his State of residence. Thus, a resident of Ohio who works in Pennsylvania will pay the tax only in Ohio.

Pennsylvania
2.318
The State personal income tax rate in Pennsylvania is two percent. The rate was reduced to two percent in 1974 from the 2.3 percent rate which prevailed when the tax was enacted in 1971. Income subject to tax includes compensation, net profits, net gains or income from disposition of property, net gains or income from or in the form

of rents, royalties, patents and copyrights, dividends, interest derived from obligations which are not statutorily free from State or local taxes, gambling and lottery winnings, and net gains or income derived through estates or trusts. On an effective rate basis (tax liability as a percent of gross income), the Pennsylvania tax is two percent of all income levels, higher than Ohio tax (ranging from .1 percent at $2,500 to 1.6 percent at $25,000) for all but the highest income levels (the Ohio tax reaches 2.4 percent of income at the $50,000 level). (Data based on a married couple with two dependents. For income levels below $7,500, there would be no tax liability in Pennsylvania.) No significant exemptions or deductions are permitted under the Pennsylvania income tax. There are, however, special tax provisions for persons earning less than "poverty income." This ranges from $3,000 for a single, nondependent person, increase to $4,200 for a taxpayer with one dependent, and is incrementally raised by $750 for each additional dependent. There is a partial exemption or refund of 90 percent of the tax for a claimant whose income exceeds the applicable base by no more than $100. For each additional $100 of excess income the allowable percentage is reduced by 10 percent down to the final point of eligibility.

Corporation Franchise Tax

Ohio

2.319

The State of Ohio imposes a franchise tax on domestic corporations organized for profit under the Ohio law and foreign corporations organized for profit which do business in Ohio. The tax was enacted in 1971. There are two alternative bases on which the tax is computed; the net worth and the income base.

> The net worth is determined by computing the total book value of the corporation's capital, surplus, undivided profits, and reserves. It is apportioned to Ohio - 50 percent on the basis of property owned in Ohio and 50 percent on the basis of business in Ohio. For corporations whose business is the sale of tangible property, the location of business activity for taxation purposes is determined by the final destination of the property; other sales are allocated according to where the income producing activity takes place.
>
> The net income base is the corporation's Ohio net income which is either allocated or apportioned to Ohio. Allocated income includes rents, royalties, capital gains and losses, patent and copyright royalties, and technical assistance fees which are allocated within or without Ohio on the basis of location. Other income is apportioned to Ohio according to a three-factor formula with equally-weighted property (excluding pollution

control facilities), payroll, and sales factors. (Property, pay roll and sales in Ohio divided by the corporation's total property, payroll and sales.)

Corporations pay the greater of the two tax liabilities computed under the alternative tax bases, with a minimum tax liability of $50 for all corporation. Assets excluded when computing net worth include: certain valuation reserves, taxes payable, abandoned property, and pollution control facilities. Income exempt under the net income base includes: income from sources outside the United States, certain dividends from other corporations, and income on which property tax has been paid. The tax rates for the two alternative bases are:

Net Worth - 5 mills on the taxable value of the corporation (the rate increased from three to four mills in 1969, and from four to five mills in 1970); or

Net Income - Four percent on the first $25,000 of taxable income plus eight percent of taxable income in excess of $25,000. (This rate has been constant since enactment of the income base alternative in 1972).

Pennsylvania
2.320
Corporations doing business in Pennsylvania must pay a tax (10.5 percent) on their net income attributable to their business activities in the State. The tax base is determined by adjusting taxable income for Federal income tax purposes by deducting U.S. interest and dividends received and other special deductions and adding certain applicable tax preference items. The Pennsylvania corporation tax rate has varied significantly in recent years. In 1967, it was increased from six to seven percent, in 1969 to 12 percent, in 1972 it declined to 11 percent, in 1974 to 91 percent, and in 1974 to 10.5 percent. Enactment of the income tax allowed for the 1972 reductions in the corporation tax rate. Pennsylvania has had a corporation income tax since 1935. Corporations with multi-State operations allocate nonbusiness income to applicable States and apportion the tax base to Pennsylvania by an apportionment formula (average of property, payroll, and sales factors). Corporation exempt from the tax include: nonprofit corporations without authority to issue capital stock; building and loan associations; savings associations trust companies; cooperative agricultural associations; and insurance companies. One significant feature of the Pennsylvania tax is that 90 percent of it must be prepaid at the beginning of the year. Pending legislation would gradually phase out the prepayment provision.

Vehicle Fuel Tax

Ohio
2.321
The State of Ohio levies an excise tax of seven cents per gallon on motor vehicle fuel sold, used or distributed in Ohio. The tax rate has remained at seven cents since 1960 when it was increased from five cents. Virtually all revenues from this tax are earmarked for highway purposes.

Pennsylvania
2.322
Pennsylvania levies a nine cents per gallon tax on motor fuels. As in Ohio, all revenues from this tax are for highway purposes. The Pennsylvania rate in 1960 was five cents, increased to seven cents in 1962, and to eight cents in 1971.

Motor Vehicle License Taxes

Ohio
2.323
Motor vehicles operated on the public roads or highways of Ohio pay a State motor vehicle license tax. The rate is $10.00 for passenger cars. For commercial trucks, it ranges from a minimum of $0.85 per 100 pounds for the first 2,000 pounds to a maximum of $3.25 per 100 pounds for vehicles in excess of 12,000 pounds. Revenues from this source are distributed to counties, municipalities and townships for highway purposes.

Pennsylvania
2.324
In Pennsylvania, the motor vehicle registration fee is $24.00 for a passenger car, and for commercial vehicles ranges from $39.00 for the first 5,000 pounds to a maximum of $606.00 for between 68,000 and 73,280 pounds.

Ohio Intangible Personal Property (State Situs)

Intangible personal property is taxable in Ohio at the following rates:

Productive Investments	5 percent of the income yield
Unproductive Investments	0.2 percent (2 mills)* of the value

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*A millage rate refer to 0.1¢ per dollar of assessed valuation. It is equivalent to $1 per thousand of assessed valuation.

Deposits	0.2 percent (2 mills) of the value
Credits (excess of accounts receivable over accounts payable)	0.3 percent (3 mills) of the value
Money and Other Intangible Property	0.3 percent (3 mills) of the value
Shares of Property Employed by Financial Institutions	0.3 percent (3 mills) of the value
Shares of Property Employed by Dealers in Intangibles	0.6 percent (6 mills) of the value

The two largest sources of intangible tax revenue in the State are deposits and productive investments. Investments refer to stock, bonds, notes, annuities, etc. Public utilities, financial institutions, dealers in intangibles, and corporations with property in more than one county in Ohio pay the tax to the State Treasurer. Individuals and corporations with property in only one Ohio county pay the intangible tax directly to the Treasurer of the county in which they reside or do business. The intangibles taxes collected by the County Treasurer are distributed primarily to libraries, but with smaller amounts to municipal and township Government and special districts, as determined by the County Budget Commission. In Ashtabula County, the County Budget Commission distributes the total amount to public libraries. Intangible taxes collected by the State Treasurer are divided between the State's General Fund and the County Undivided Local Government Fund for distribution to county Governments and local Governments.

j) Local Taxes

Real Estate Tax

Ohio
2.325
All land and improvements in Ohio are subject to the local real estate tax unless exempted under State law. Exemptions authorized by State law are generally similar to those authorized in Pennsylvania and include:

> Exemption of the real property of governmental or private institutional owners on the grounds of ownership and/or usage (e.g., schools, hospitals, churches, charitable organizations, etc.).

Tax reductions in the form of a homestead exemption for elderly and disabled homeowners. (The State reimburses the local Governments for the tax reduction).

Land devoted exclusively to agricultural use which may be valued according to current use instead of "highest and best" use.

2.326
The County Auditor, under the supervision of the State Board of Tax Appeals, assesses real property. County assessments are used for levying property taxes by townships, municipalities, and school districts. Assessment appeals may be taken to the County Board of Revision, the State Board of Tax Appeals, and then to the State Supreme Court or other court of the county where the property is located. Alternatively, appeals from the Board of Revision may be taken to the county court of common pleas. Real property is assessed in the county where located. Property is taxed as of 1 January annually, with half the tax paid the following December and the remainder, the subsequent June. Under Ohio law, real estate is to be assessed at 35 percent of market value. A reappraisal of real property in each county is required once every six years, with valuations to be updated in the third year following each reappraisal. Ashtabula County completed a reappraisal in 1972 and is now undergoing a second appraisal to be effective in 1978. For public utilities, the tax base includes tangible personal property (machinery and equipment) as well as real estate. Agricultural property is assessed on the basis of current (rather than highest and best) use as a result of a 1973 constitutional amendment.

2.327
Within each taxing jurisdiction, the tax rate includes all levies enacted by the legislative authority or approved by voters for all taxing jurisdictions within which the property is located (i.e., county, township, municipality, and school district). The property tax rates for all taxing jurisdictions in Ashtabula County are shown in Table 2-216. The total tax bill of each real property owner (as computed using tax rates applicable in each taxing jurisdiction in which the property is located) is reduced by 10 percent each year with the State reimbursing the local Governments and school districts for the lost revenues. In 1975, the State reimbursed all local Governments and school districts $152.5 million as a result of the 10 percent rollback.

2.328
The County Budget Commission plays a role in fixing the tax rates for local Governments and school districts through its annual review of their budgets. Each taxing authority (school district, municipality,

Table 2-216

Local Property Tax Rates in the Coastal Communities -- 1975
(Dollars Per Thousand of Assessed Valuation)

Ohio	
Conneaut City	$ 5.340
Kingsville Township	5.330
North Kingsville Village	4.130
Ashtabula Township	4.840
Ashtabula City	11.115
Saybrook Township	4.320
Conneaut Area City School District	27.790
Buckeye Local School District	27.650
Ashtabula Area City School District	29.610

Pennsylvania	
East Springfield Borough	$ 1.50
Springfield Township	2.00
Girard Borough	11.00
Girard Township	2.00
Lake City Borough	10.00
Platea Borough	5.00
Fairview Borough	6.00
Fairview Township	2.00
Millcreek Township	12.500
Northwestern School District	63.00
Girard School District	77.00
Fairview School District	69.00
Erie County	12.50
Millcreek School District	58.50

Source: 1975 Property Tax Rate, Pennsylvania Department of Commerce; Rates of Taxation for 1975, Ashtabula County Treasurer.

or township or county) submits its budget for review to the County Budget Commission which is comprised of the elected County Auditor, Prosecutor, and County Treasurer. After review of the budget, the County Auditor furnishes each taxing authority with an estimate of the taxes necessary to fund the budget. If budget revenues are insufficient, the taxing authority can either reduce its proposed expenditures to meet the anticipated revenues as determined by the Budget Commissioner or can adopt a resolution to levy an additional tax which is submitted to the voters in a general election. If approved, the County Auditor puts it on the tax list for collection. The Ohio Constitution prohibits governmental units from levying property taxes which in the aggregate exceed one percent of property values, unless they are approved by the voters. This provision has been interpreted to consist of a 10-mill limitation beyond which all increases must be approved by the voters. The millage levied within this 10-mill limitation is commonly referred to as "inside" millage. All millage increases beyond the 10-mill limit must be approved by a vote of the people. The County Auditor determines each taxing jurisdiction's millage limit inside the 10-mill limit by apportioning it among the school district, county, township, and municipality. For example, in the city of Conneaut, the city's (1975) inside millage was 3.8 mills, the school district's was 3.68, and the county's was 2.52 mills.

Pennsylvania
2.329
For many counties, school districts, and municipalities in Pennsylvania, the real estate tax is the principal source of revenue. The Pennsylvania Constitution and statutes grant certain exemptions from the local real property tax. These exemptions are similar to the ones granted in most other States and include publicly-owned property, churches, cemeteries, and property of veterans organizations, hospitals, educational institutions, and benevolent institutions. Real estate owned by public utilities is taxed by the State, with revenues distributed among local taxing jurisdictions. Assessment of property for county, local Government, and school district property tax purposes is the responsibility of the county. One exception is that certain cities (including Erie) have the option of making their own assessments for city and school district property tax purposes. In Erie and Crawford Counties, the Assessment Bureau under the direction of an appointed Chief Assessor is responsible for assessing property. County assessment laws generally call for the appraisal of properties at full market value. Assessments, however, generally are made at a predetermined ratio of market value. Real estate in Erie County is assessed at about 20 percent of current market value, and in Crawford County at about 15 percent of current market value. An exception to the above is land devoted to agricultural or forest reserve use, which under 1974 "Clean and Green" legislation is taxed on the basis of current use.

2.330
The Chief Assessor prepares an assessment roll which lists the valuation and owner of each parcel of real estate divided into land and building. The county board in charge of assessments may make revisions in the rolls for the sake of equalizing valuations among property owners and local jurisdictions. Appeals from property owners and local Governments may be made to the County Board of Revision and Tax Appeals and the County Court of Common Pleas. The information on the assessment rolls is transferred to the tax duplicate for each local taxing unit (county, township, city, borough, or school district) which is a listing of the amount of tax levied against each taxpayer and property in the local unit. The levying of local taxes is the function of the governing bodies of local units including the boards of county commissioners, the city and borough councils, the township boards of commissioners and supervisors, and the boards of school directors. This is accomplished within the limits set by the Constitution and State law. The rates of real estate taxation are determined on the basis of the number of mills for each taxable dollar. The Constitution of Pennsylvania requires that all taxes be uniform on the same class of subject within the boundaries of the taxing jurisdiction. Therefore, millage rates and millage rate limits are the same for a given class of property.

2.331
The tax due on any property is based on the rate for all the taxable jurisdictions in which the property is located. Pennsylvania residents of a borough or city do not pay the township tax. The property tax rates for all taxing jurisdictions in Erie County are shown in Table 2-215. In counties, the maximum rates of taxation for general county purposes range from 10 to 20 mills. Special purpose levies include unlimited millage for debt service, 10 mills for county institution districts (second and third class counties) and 10 mills for payment of rentals to municipal authorities (third through eighth class counties). Special levies are also permitted for parks and playgrounds, libraries, roads and bridges, memorial halls and, with voter approval, for certain hospitals. A summary of the statutory limits on property tax rates is presented in Table 2-217. In boroughs, tax levies on real estate and occupations for general purposes must be limited to 30 mills. For debt service, however, there is unlimited millage. Limitations on special purpose millage include the following: for borough employees' benefits, not more than one-half mill; for acquisition of recreation places, no limitation; for shade trees, not more than one-tenth of a mill; for the maintenance of libraries, not more than two mills; for permanent street improvements, not more than five mills; for street lighting, not more than eight mills. In addition, taxes may be levied by referendum only for the following: gas, water and light (not more than five mills), and for the purchase of fire equipment, or erection and maintenance of a

Table 2-217

Pennsylvania Property Tax Limitations

Taxing Jurisdiction	Statutory Rate Limitations[1]
Counties, Second Class (Allegheny)	10 mills
Counties, Second Class A (Delaware and Montgomery)	20 mills
Counties, Third Class	15 mills
Counties, Fourth through Eighth Classes	20 mills
Institution Districts	10 mills
Cities, First Class (Philadelphia)	No Limit
Cities, Second Class (Pittsburgh) and Second Class A (Scranton)	No Limit
Cities, Third Class	25 mills
Boroughs	30 mills
Townships, First Class	30 mills
Townships, Second Class	14 mills
School Districts, First Class (Philadelphia)	No Limit
School Districts, First Class A (Pittsburgh)	26.25 mills
School Districts, Second, Third and Fourth Classes	25 mills

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(1) An additional 5 mills are authorized, subject to court approval.

Source: Pennsylvania Department of Community Affairs.

firehouse (not more than three mills). The board of township commissioners may levy an annual tax for township purposes not exceeding 30 mills on all taxable property in first class townships and 14 mills for second class townships. Additional levies of specified amounts for certain purposes are also permitted. In all school districts (excluding Philadelphia) there is a 25 mill rate limit, but they are, however, authorized to levy enough taxes to pay the full amount of minimum salaries and increments of the teaching and supervisory staff, school building rentals and interest and sinking fund charges on indebtedness. Thus the legal millage limits are of secondary importance. Generally, the tax rates for the Coastal Communities in Erie County are well below these statutory limitations.

Ohio Tangible Personal Property Tax

2.332
Local Governments in Ohio (including school districts, counties, municipalities, and townships) levy taxes on the value of tangible personal property used in business. The millage rates for tangible personal property are the same as those used for real property. However, the 10 percent tax reduction for all real property does not apply to tangible property. Tangible personal property includes machinery and equipment and equipment and inventories. Taxable inventories include raw materials, goods in process, and goods in transit. Property exempted from the tangible personal property tax includes:

Licensed motor vehicles and aircraft;

Patterns, jigs, dies, and drawings used in business which are held for use and not for sale;

Certified air, water, and noise pollution control equipment.

A bill enacted in 1976 exempts certain coal conversion (into other fuels) and coal desulfurization equipment from the tax for a period of 30 years. Conversion facilities must be constructed between 1 January 1975 and 31 December 1982.

2.333
The tangible personal property tax is considered self-assessed through filing of an annual return with either the County Auditor (for singlecounty corporations and unincorporated businesses) or Tax Commissioner (for intercounty corporations). Except for inventories, which generally are listed on the return on an average monthly basis, taxable personal property is listed as of 31 December or an

authorized fiscal year end. For the 1977 tax returns, tangible property is assessed at the percentages of true value shown in Table 2-218. Ohio law provides for these percentages to be gradually reduced (the reductions began in 1972) to 35 percent in future years (except the 100 percent electrical equipment rate) when tangible personal property tax collections increase by at least 4.35 percent. Generally, the reduction is two percentage points each year the conditions have been met. The assessment percentages above are applied to the true value of tangible personal property to determine taxable value. The true value of depreciable assets is statutorily defined as depreciated book value unless the assessor determines otherwise. The true value of manufacturers' and merchants' inventories is determined by the average monthly value (cost of acquisition) of the inventories. Inventories of other taxpayers are listed at their value as of the tax listing date. The tax rates applied to tangible personal property are the same as the rates developed and applied to real estate. After administrative deductions, revenue is distributed by the State through county treasurers to counties, municipalities, townships, and school districts according to the taxable values and total millage levied by each.

Intangible Personal Property Tax

Ohio
2.334
Both Ohio and Pennsylvania levy taxes on intangible personal property. In Ohio, the tax is partly State and partly local as discussed earlier in this section.

Pennsylvania
2.335
In Pennsylvania, the personal property tax is levied by counties. They are authorized to levy a tax on intangible personal property at the rate of four mills per dollar of value. The tax applies to mortgages; other interest bearing obligations and accounts; public loans except those of the United States, the Commonwealth of Pennsylvania or its civil subdivisions; corporate loans not subject to the corporation loans tax; shares of stock other than that subject to the capital stock or the bank shares. The personal property tax is imposed on personal property held or possessed by any resident. In third class counties, the property is valued by the Board of Revision and Assessment Appeals and in fourth through eighth class counties by the Boards of County Commissioners.

Table 2-218

Ohio Tangible Property Assessment Rates -- 1977

Class of Property	Assessment Percentage
Manufacturing Machinery and Equipment	48%
Manufacturers' Inventories	43
Merchants' Inventories	43
Restaurant Property	48
Electrical Equipment(1)	100
All Other Property(2)	48

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(1) Includes only property used in generating or distributing electricity to others (except utilities).

(2) Includes furniture and fixtures.

Source: Ohio Department of Revenue.

Other County Taxes

Ohio

2.336

In 1967, the Ohio General Assembly granted Ohio's 88 county Governments the authority to impose four new taxes. These include a real estate transfer tax, a motor vehicle license tax, a utility service tax, and a retail sales and use tax. The Legislature also authorized municipalities to impose a motor vehicle license tax if the county in which such municipalities are located does not levy the tax. Ashtabula County levies the mandatory one-mill per dollar real estate transfer tax and the recently adopted (November 1977) one-half percent sales tax. The cities of Ashtabula and Conneaut levy the $5 motor vehicle tax. In general, the permissive taxes have gained only minimal acceptance in Ohio. For example, as of 1975, only 31 counties (out of 88) levied the sales tax.

Pennsylvania

2.337

Counties in Pennsylvania also rely on taxes other than the property tax. An occupation tax is authorized for fourth to eighth class counties. The tax is levied at the millage rate applied to the assessed value of the occupation of persons, including housewives, as determined by the county assessors. Neither Erie (a third class county for which the tax is not authorized) nor Crawford County levy this tax. As an alternative to the occupation tax, fourth through eighth class counties are authorized to levy a $5 per capita tax. Crawford County levies this tax which is a minor revenue item.

Other Local Taxes

Ohio

2.338

The income tax is the principal source of revenue for Ohio municipalities. The tax is generally imposed on wages, salaries, and other compensation earned by residents and nonresidents for work done in the municipality, and, unlike in Pennsylvania, to the net profits of business both incorporated and unincorporated, attributable to activities in the municipality. The tax is generally levied on a place of work basis, and most municipalities grant credits to residents who work in other jurisdictions that levy the tax. State law requires uniform rates within a municipality. Rates are determined locally. All rates in excess of one percent must be approved by a vote of the people. Rates vary from 0.025 percent to two percent. The tax rate is one percent in Conneaut, 1.2 percent in Ashtabula City, and 1.0 percent in the village of North Kingsville. The permissive taxes authorized by the Legislature in 1960 for local Governments (municipalities and townships) include an excise tax on hotel and motel

accommodations not to exceed three percent. This tax is not levied in Ashtabula County.

Pennsylvania
2.339
Far-reaching tax-enabling legislation applicable to almost all political subdivisions in Pennsylvania has given local Governments (other than counties) and school districts a broad range of nonreal estate tax sources. The only significant local revenue producer found in some other States but not in Pennsylvania is the sales tax. The taxes most commonly in use by Pennsylvania local Governments and school districts are the following: earned income or wage, per capita, occupation, occupational privilege, mercantile or gross receipts, personal property, real estate transfer, amusement, and mechanical devices. The principal sources of local Government taxing power are the respective codes of law applicable to counties, municipalities, and school districts and the general tax enabling acts. Taxes authorized by local codes or other laws include the per capita tax, the occupation tax and the mercantile or gross receipts tax, most of which are not utilized extensively in Erie and Crawford County, and when used produce relatively small amounts of revenue. The most significant of these is the per capita tax. A per capita tax is a flat rate tax levied upon each adult within the taxing district (18 and over). The tax has no connection with employment, income, voting rights or any other factor except residence within the community. This tax is not levied by local Governments in Erie County, and is levied in only one city in Crawford County: Meadville. It is, however, levied by the Fairview, Girard, and Northwestern School Districts. The Local Tax Enabling Act (Act 511 of 1965) is often referred to as the "tax anything" act, gave local Governments and school districts (but not counties) general authorization to tax anything not taxed by the State. Through legislative and court restrictions, the Act now contains a series of express grants of power to levy certain taxes, at prescribed rates, in a manner prescribed by law. The principal Act 511 taxes are the per capita tax and the earned income tax, both discussed below.

2.340
Earned Income Tax. The maximum rate of the earned income tax is one percent for all jurisdictions except cities of the second class 2A (Scranton). The tax must be shared at least on a 50/50 basis between municipalities and school districts. The tax applies to wages, salaries, commissions, and other earned income (including fees and tips) and is levied mainly on a place of residence basis. The local

income tax rates in the Coastal Communities in Erie County are as follows:

Local Government	Percent	School Districts	Percent
East Springfield Borough	0.4	Northwestern	0.6
Springfield Township	0.4	Girard	0.5
Girard Borough	0.5	Fairview	1.0
Girard Township	0.5	Millcreek	0.5
Lake City Borough	0.5		
Platea Borough	0.4		
Fairview Borough and Township	0		
Millcreek Township	0.5		

The earned income tax is the most productive of the Act 511 taxes and is a major source of revenue for local Governments and school districts. The income tax rates for jurisdictions in the area have remained fairly constant. Springfield's rate has been one percent (combined school district and township) since the tax became effective in 1965. Girard, Lake City, and Platea Boroughs (combined school district and municipal) rates have been one percent since 1970, as has Girard Township.

2.341

Per Capita Tax. This tax is levied at a flat rate against each adult residing in the taxing jurisdiction. The tax has no link with employment, income, voting rights, or any other factor except residence in the community. The Act provides for a $10.00 maximum rate which must be shared on a 50/50 basis between the school district and municipality unless agreed to otherwise. School districts can levy this per capita tax in addition to the $5.00 per capita tax. Many taxing jurisdictions are extending liabilities for this and other personal taxes to persons between 18 and 21 years of age. Per capita tax rates in the Coastal Communities in Erie County are as follows:

Local Government	$	School Districts	$
East Springfield Borough	$ 0	Northwestern	$ 7.50
Springfield Township	0	Girard	5.00
Girard Borough	5.00	Fairview	5.00
Girard Township	2.50	Millcreek	5.00
Lake City Borough	5.00		
Platea Borough	5.00		
Fairview Borough	5.00		

Fairview Township	5.00
Millcreek Township	0

Debt Limitations

Ohio
3.342
Ohio law provides that the net debt of municipalities whether voter approved or not, cannot exceed 10.5 percent of all the property in the municipal corporation as listed and assessed for taxation. The net debt of municipalities incurred without a vote of the people cannot exceed 5.5 percent of total value of assessed property. Net debt excludes tax anticipation or bond anticipation notes and bonds or notes for the purpose of purchasing, constructing, improving or extending waterworks, sewage disposal plants or sewage systems, and other specified purposes. The constitutional 10-mill limit may also operate as a debt limitation. Most bonds (excluding anticipation bonds and notes) must be approved by the voters. If an unvoted bond issue would raise the millage requirements for existing and proposed unbonded debt (including overlapping jurisdiction) beyond the 10-mill limit, the 10-mill limit will be exceeded and the bond cannot be issued. The 10-mill limit also acts as a debt limit since an increase in inside millage for debt purposes would reduce the amount of inside millage revenue available for general operating expenses. Net indebtedness created or incurred by a township may not exceed two percent of the value of all property in the township as listed and assessed for taxation. The total net indebtedness created or incurred by a county cannot exceed a sum equal to three percent of the first $100 million of taxable property values plus 1.5 percent of the taxable value in excess of $100 million plus 2.5 percent of the value in excess of $300 million. Net indebtedness incurred without a vote of the people may not exceed one percent of the tax list of the county. Certain bonds are not included in the limit, such as those issued for the purpose of purchasing, constructing, improving, or extending water and sewage systems. The net indebtedness created or incurred by any school district with or without a vote of the people may not exceed nine percent of the total value of all property in any school district as listed and assessed for taxation. The net indebtedness created or incurred by a school district without a vote of the people cannot exceed 0.1 percent of the total value of taxable property in the district. There are certain exceptions to these limitations such as bonds to replace or repair a building damaged by fire.

Pennsylvania
3.343
The Local Government Unit Debt Act (Act 185 of 1972) is the exclusive method for local Government borrowing on bonds and notes. The provisions of this Act determine the limitations on municipal indebtedness

and the procedure for issuing the debt. The Act specifies two separate basic debt limits, one when incurring nonelectoral debt and the other when incurring new lease rental debt. It provides that no local Government unit may incur any new debt, if the aggregate net principal amount of such new debt together with all other net nonelectoral debt outstanding would cause the total net nonelectoral debt to exceed:

> 100 percent of its borrowing base in the case of a school district of the first class,
>
> 300 percent of its borrowing base in the case of a county, or
>
> 250 percent of the borrowing base in the case of any other local Government unit.

It further provides that no local Government unit shall incur any new lease rental debt if the aggregate net principal amount of such new debt together with any other net nonelectoral debt plus net lease rental debt would exceed:

> 150 percent of the borrowing base in the case of a school district of the first class,
>
> 350 percent of the borrowing base in the case of a county, or
>
> 300 percent of the borrowing base in the case of all other units of local Government.

The borrowing base is the annual average of the total revenues for the three full fiscal years immediately preceding the incurring of nonelectoral debt or lease rental debt. Total revenues means all monies received by the local Government unit. The following types of revenues are excluded by the statute:

> Subsidies or reimbursements from the Federal or State Government related to a particular project financed by debt;
>
> Revenues, rates, receipts, user charges, special assessments and special levies pledged for specific self-liquidating debt (any excess revenues returned to the local Government for general operating purposes shall not be excluded);
>
> Interest on monies in sinking funds or reserves which are pledged for the payment or security of outstanding debt;
>
> Grants and gifts designated for a specified project; and

Nonrecurring receipts such as bonds and net proceeds and sales of capital assets.

The borrowing base certificate accompanies and is part of every debt statement filed under the Act. The certificate is to be executed and certified by the officials of the local Government unit auditing its financial affairs or by the independent public accountants regularly auditing its accounts.

Infrastructure

Water Supply

a) Total Regional Study Area

2.344
Nearly 70 percent of the population in the Regional Study Area is served by central water supply systems, both publicly and investor owned. Most of the water supply is derived from either Lake Erie or from groundwater; very little supply is presently obtained through surface water impoundments (raw water storage reservoirs). A major exception is the Ohio Water Service Company in western Ashtabula County which derives water from the Grand River and Mill Creek. Public water supply system capacities in the total Regional Study Area range from 0.02 million gallons per day for Palmer Shores Water Company and Paul Hudacky Water Company in Erie County, PA, to 88.0 million gallons per day for the city of Erie, Bureau of Water. There are over 30 centralized systems in the Regional Area. The majority of the systems in the Regional Area have capacities below 5.0 million gallons per day. Table 2-219 lists the existing water supply systems in the Regional Study Area and provides information on the reported number of connections, the sources of supply (wells, Lake Erie, inland surface waters, springs), the annual average daily withdrawal, and the estimated capacities. Four of the seven water supply systems in Ashtabula County are publicly-owned, whereas 20 out of 27 systems in Crawford and Erie Counties are publicly-owned. The geographic coverage of the water supply systems in Ashtabula and Erie Counties are shown on Figures 2-23 and 2-24.

b) Ohio Principal Study Area

2.345
The Ohio Principal Study Area is served by four major central water supply systems as displayed on Table 2-220. The table relates the water supply systems to the communities in the area which are served. Ashtabula Water Works Company is the largest system in the area with an estimated capacity of 9.9 million gallons per day (MGD) and approximately 9,040 connections. Conneaut Water Department and the

Table 2-219

Public Water Supply Systems in the Regional Study Area -- 1975 and 1976

Water Supply System	Approximate Number of Connections	Source of Supply	Average Groundwater Withdrawal (MGD)(1)	Average Surface Water Withdrawal (MGD)	Average Total Withdrawal (MGD)	Estimated Capacity (MGD)
Ashtabula County (1975)						
Andover	415	3 wells	0.15	-	0.2	0.50
Ashtabula Water Works Co.	9,038	Lake Erie	-	5.1	5.1	9.9
Conneaut	over 6,000	Lake Erie	-	2.0	2.0	3.0
Lakeside Utilities Corp.	175	Roaming Rock Lake	-	0.05	0.05	0.2
Ohio Water Service Co., Lake Erie Division:						
Geneva Plant	4,531	Grand River	-	2.1	3.0	3.5
Jefferson Plant	936	Mill Creek	-	0.3	0.3	-
Orwell	250	3 wells	0.1	-	0.1	0.4
Rock Creek Village	195	Grand River	-	0.1	0.1	0.2
Erie County (1976)						
Albion Borough	672	3 springs & 3 wells in glacial till	0.2	-	0.2	0.4
Edinboro Borough	1,318	3 wells in glacial outwash	0.8	-	0.8	3.8
Girard Borough	960	3 wells in lacustrine deposits	0.2	-	0.2	0.7
City of Erie, Bureau of Water	45,656	Lake Erie	-	44.1	44.1	88.0
Corry Water Supply Co.(2)	2,842	21 wells in glacial outwash	1.2	-	1.2	2.4
Fairview Borough W. Authority	538	3 wells	0.1	-	0.1	0.8
Lake City Borough	626	3 wells in lacustrine deposits	0.2	-	0.2	1.9
Lake Shore Maintenance Association	253	2 wells in lacustrine deposits	0.1	-	0.1	0.4
Mun. Auth. of Borough of Union City	1,271	Surface water	-	0.5	0.5	0.6
Mun. Auth. of Borough of Waterford(2)	464	1 well in glacial outwash	0.1	-	0.1	0.6
North East Borough Water Department	1,374	1 spring in Susquehana Group plus surface water	N/A	N/A	-	7.1
Penn. Water Co., Erie Suburban Division						
Westminster-Asbury Subdiv.	1,883	10 wells in lacustrine deposits	0.8	-	0.70	-
Whitehall Village Subdiv.	164	4 wells; one in lacustrine deposits	0.1	-	0.06	-
Walnut Heights Subdiv.	65	2 wells	0.02	-	0.02	-
White Swan Subdiv.(2)	112	2 wells	0.01	-	0.01	-
Greenbriar Subdiv.	53	1 well in lacustrine deposits	0.02	-	0.02	-
Total					1.0	2.0
Palmer Shores Water Co.	55	1 well in lacustrine deposits	0.01	-	0.01	0.02
Paul Hudacky Water Co.	25	1 spring	0.004	-	0.004	0.02
Crawford County (1976)						
Boro. of Cambridge Springs(2)	742	Surface water	-	0.41	0.4	6.5
Borough of Cochranton(2)	518	2 wells in glacial outwash	0.08	-	0.1	0.7
City of Meadville	5,312	7 wells in glacial outwash	2.1	-	2.1	12.1
Conneaut Lake Park Inc.	235	1 well in glacial outwash	0.1	-	0.1	0.3
Conneautville Borough Water Department	361	1 spring and 2 wells in glacial outwash	0.1	-	0.1	0.7
Kent Water Supply(2)	23	1 spring in Pottsville Group	0.003	-	0.003	N/A
Mun. Auth. of Conneaut Lake	295	1 well	0.06	-	0.06	0.4
Oakland Beach Water Co.	458	1 well	0.01	-	0.1	1.0
Ridgeville Water Co.	57	3 wells in lacustrine deposits	0.02	-	0.02	0.3
Pleasant Mills	20	1 well in Cattaraugus Pa.	0.003	-	0.003	0.1
Saegertown Borough	358	2 wells in glacial outwash	0.4	-	0.4	0.9
Springboro Water Department	186	2 wells in glacial outwash	0.03	-	0.03	0.4
Titusville Mun. Wat. Auth.	2,736	10 wells in Pocono Group	2.2	-	2.2	3.7
Linesville Mun. Wat. Auth.	410	4 wells and 20 springs in Pocono Group	0.1	-	0.1	0.5

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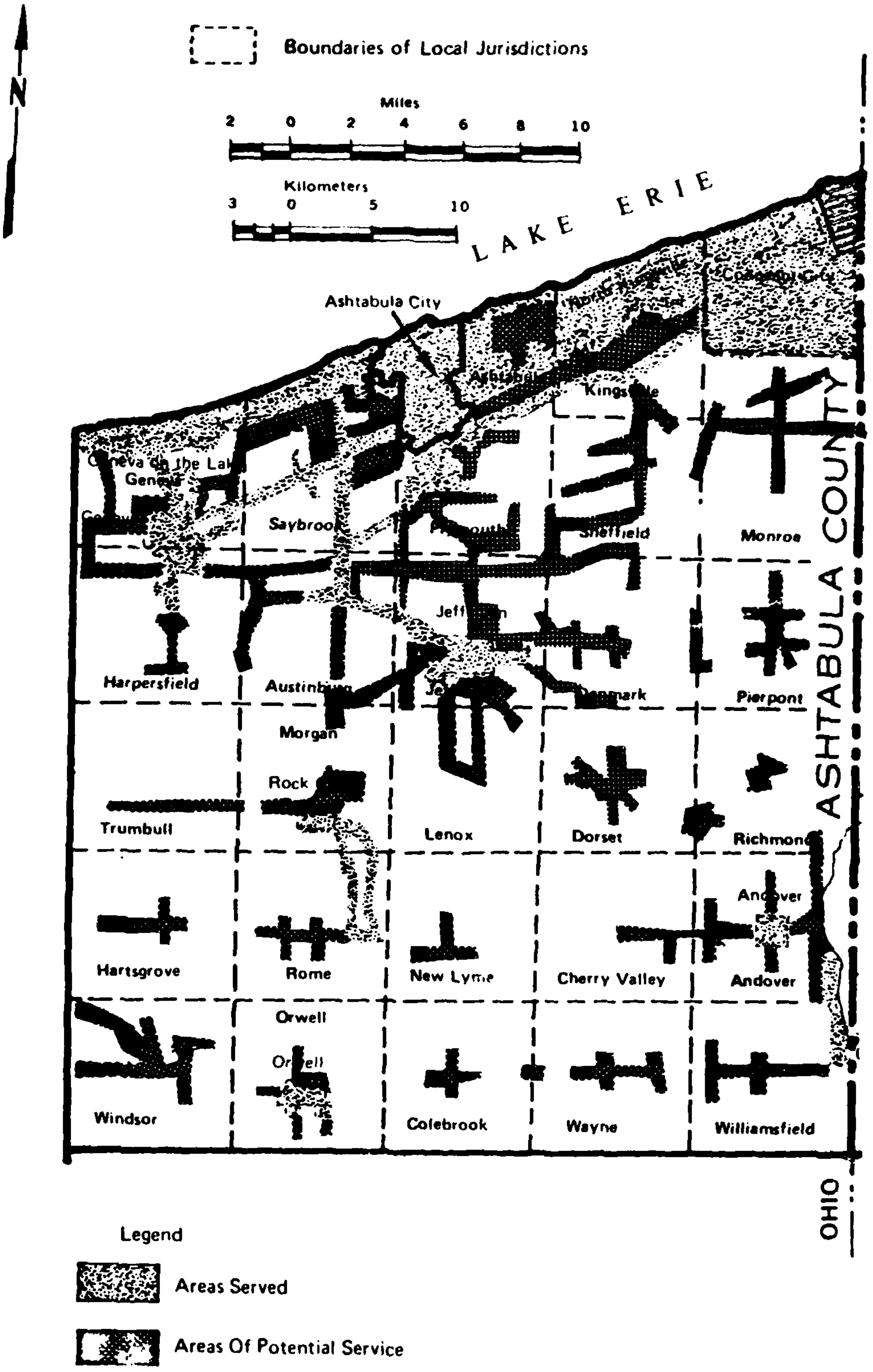
(1) All estimates rounded to nearest 0.1 MGD.

(2) 1969 date.

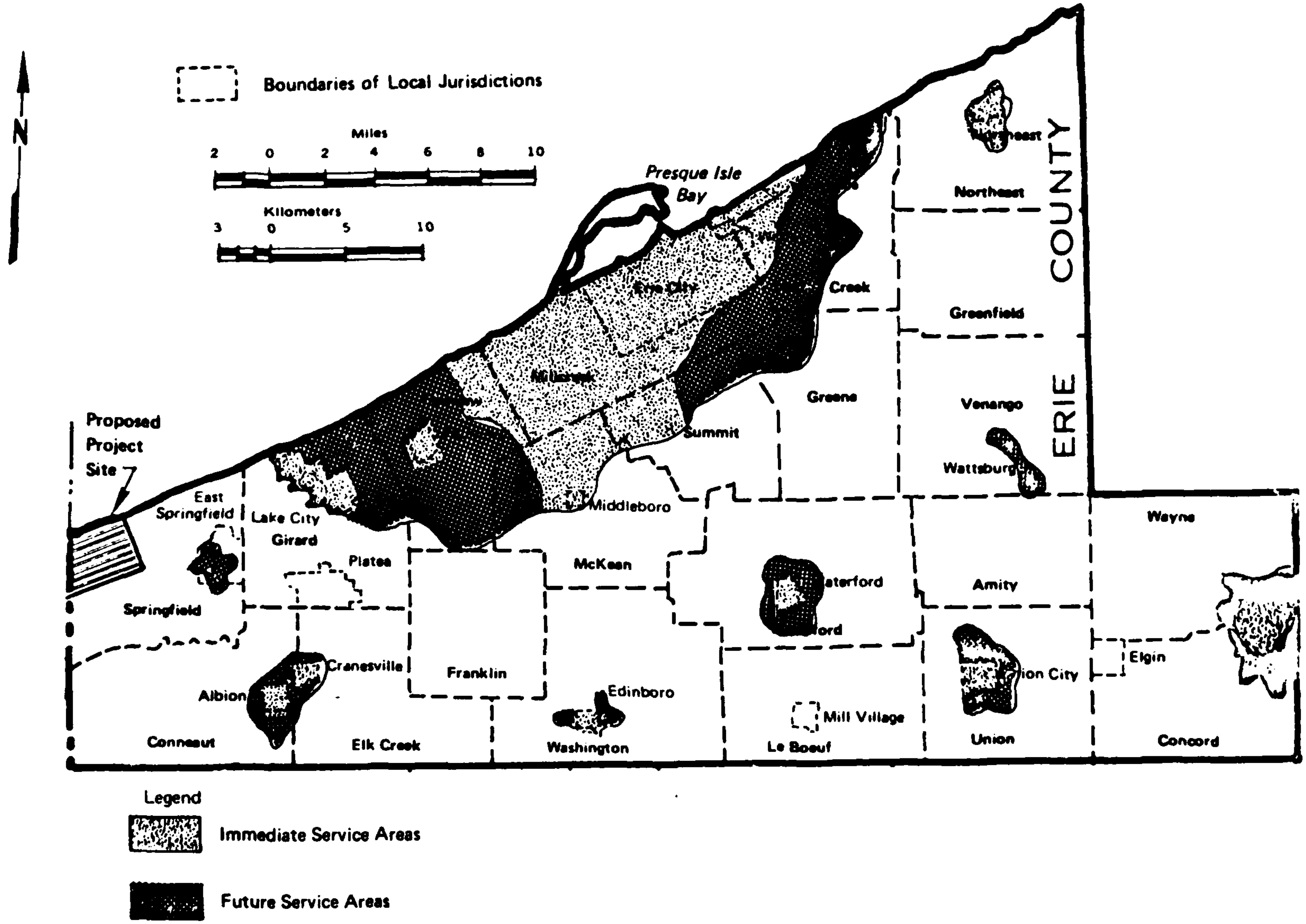
N/A = Not Available.

Source: Compiled by Geraghty and Miller, Inc., with data from the Ohio Department of Natural Resources and the Pennsylvania Department of Environmental Resources.



Source: Ashtabula County Planning Commission.

FIGURE 2–23 ASHTABULA COUNTY WATER SUPPLY SERVICE



Source: Erie County Planning Commission.

FIGURE 2–24 ERIE COUNTY WATER SUPPLY SERVICE

Table 2-220

Central Water Supply Systems in the Principal Study Area

	Central Water Supply System(s)
Ohio Principal Study Area	
Conneaut City	• Conneaut Water Department
Kingsville Township and Village	• Ashtabula Water Works Co. (AWW Co.)
Ashtabula Township	• AWW Co. and Ohio Water Service Co.
Ashtabula City	• Ashtabula Water Works Co.
Saybrook Township	• Ohio Water Service Co.
Rest of Principal Study Area(1)	• Ohio Water Service Co. (Jefferson Township) • Andover Water Department (Andover Village) • None
Pennsylvania Principal Study Area	
Springfield(2)	• None
Girard (includes Girard Township Girard Borough, Lake City, and Platea Borough)	• Girard Borough Water Department • Lake City Municipal Water Works • (None in remainder of Girard Township)
Fairview(3)	• Fairview Borough Water Authority (Fairview Boro.) • Erie Suburban Water Co. (Fairview Township)
Millcreek Township	• Erie Suburban Water Co. • City of Erie, Bureau of Water • Ridgefield Water Co.
Rest of Principal Study Area(4)	• City of Erie, Bureau of Water (Erie City, Lawrence Park, Wesleyville) • Albion Municipal Water System (part of Conneaut Township and Elk Creek Township--Albion and Cranesville Boroughs) • Edinboro Borough Water Authority (Washington Township) • Springboro Water System (Spring Township) • Conneautville Water System (Spring Township) • Conneaut Lake Park, Inc. (Sadsbury Township) • Municipal Authority, Borough of Conneaut Lake (Sadsbury Township) • Bundy Water Co. (North Shenango Township) • Oakland Beach Water Co. (Sadsbury Township)

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(1) Includes: Plymouth, Jefferson, Sheffield, Monroe, Denmark, Pierpont, Dorset, Richmond, Andover, and Williamsfield Townships.

(2) Includes: Springfield Township and East Springfield Borough.

(3) Includes: Fairview Township and Fairview Borough.

(4) Includes: (In Erie County), Conneaut Township; Elk Creek Township; Franklin Township; McKean Township; Washington Township; Lawrence Park; Wesleyville; Erie City Harbor Creek Township;Greene Township; Summit Township; and (in Crawford County) Beaver Township; Spring Township;Cussewago Township; Conneaut Township; Summerhill Township; North Shenango Township.

Source: Compiled by Arthur D. Little, Inc.

Ohio Water Services Company, Lake Erie Division are the next largest systems with estimated capacities of 3.0 MGD and 3.5 MGD, respectively. Both the Ashtabula Water Works Company and the Conneaut Water Department obtain their supply of water from intake structures in Lake Erie. The Grand River and Mill Creek are utilized by the Ohio Water Services Company as a water source. The Andover Water Department has the lowest capacity which is estimated at 0.50 MGD. Table 2-219 indicates a total capacity (all public water systems in the Principal Study Area combined) of 16.9 MGD.

c) Pennsylvania Principal Study Area

2.346
Water service to the Pennsylvania Principal Study Area is supplied by 16 major central water supply systems. These systems and the communities they serve are given on Table 2-220. There are 14 major centralized water supply systems serving the Principal Study Area. The largest system in the Pennsylvania Principal Study Area is the city of Erie, Bureau of Water, which has an estimated capacity of 88 MGD, 45,656 residential and industrial customers, and serves a population of 185,000 persons. The systems in the Principal Study Area with the smallest capacities (at or below 0.4 MGD) are Conneaut Lake Park, Inc., Albion Municipal Water System, the Municipal Authority of Conneaut Lake, and the Springboro Water Department. None of these systems serve more than 700 customers.

d) Ohio and Pennsylvania Coastal Community Water Supply Systems

2.347
There are eighteen major water supply systems in the Principal Study Area (four systems in Ohio and 14 systems in Pennsylvania). Eight of these systems (three in Ohio and five in Pennsylvania) which are closely related to the Coastal Communities have been selected for detail study. The major reason for focusing on the Coastal Communities is that these communities are expected to accrue most of the secondary development associated with the proposed steel plant. The eight water supply systems are as follows:

Ohio

Conneaut Water Department

Ashtabula Water Works Co.

Ohio Water Service Co., Lake Erie Division

Pennsylvania

Girard Borough Water Department

Lake City Municipal Water Works

Pennsylvania Water Co., Erie Suburban Division

Fairview Borough Water Authority

City of Erie, Bureau of Water

2.348
The number of customers served by each of the major supply systems is shown in Table 2-221. The largest system in Ohio Coastal Communities, the Ashtabula Water Works Company (AWWC), serves a population of approximately 37,600 persons through 9,038 residential and industrial connections. Approximately 48 percent of AWWC water consumption is by residential customers. In Ashtabula County, the Ohio Water Service Co., has 5,467 residential and industrial customers and serves a population of 17,119 persons. The Conneaut Water Department with over 6,000 residential and industrial customers serves a total population of 14,522 persons. The city of Erie, Bureau of Water, is the largest system in the Pennsylvania regional study area, with 45,656 residential and industrial customers and a capacity of 88.0 MGD. This system provides service to approximately 185,000 persons. Other water supply systems in Erie County, PA, are smaller (refer to Table 2-221) with the largest of these being the Pennsylvania Water Company, Erie Suburban Division, serving Millcreek Township. This system has about 2,279 customers. Throughout the coastal communities (Ohio and Pennsylvania), the city of Erie, Bureau of Water, is the largest centralized system followed by the Ashtabula Water Works Company and the Ohio Water Service Company, Lake Erie Division. The percentage of water consumption by residential users ranges from 48 percent in Ashtabula City where the system supplies a number of water use intensive chemical industries to a high of 97 percent in Fairview Borough which has no heavy industry requiring water supply.

Administrative and Operational Characteristics

2.349
The administrative and operational characterisitcs for the three major water supply systems serving the Ohio Coastal Communities are presented on Table 2-222. Except for the Conneaut Water Department, the major supply systems have operating costs which are less than revenues generated from the sale of water and from installation work and repairs. Most of the operating costs shown on the table are for wages and salaries. The number of employees presently working at

Table 2-221

Service Characteristics of Major Water Supply Systems in the Principal Study Area

Water Supply Systems (and Source)	Estimated Capacity (MGD)	Total Number of Connections (Residential and Industrial Customers)[1]	Population Served (1975 and 1976)	Percent of Water Consumption That is Residential
Ohio				
Conneaut Water Department (Lake Erie)	3.0	over 6,000	14,522	54%
Ashtabula Water Works Co. (Lake Erie)	9.9	9,038	37,629	48%
Ohio Water Service Co., Lake Erie Division (Grand River Millcreek)	3.5	5,467 (Ashtabula County only)	35,855 Total (17,119 in Ashtabula)	72%
Pennsylvania				
Girard Borough Water Department (3 wells)	1.5	960	2,692	77%
Lake City Municipal Water Works (3 wells)	1.7	626	2,290	54%
Pennsylvania Water Co., Erie Suburban Division (12 wells)	1.0	2,279	11,500	61%
Fairview Borough Water Authority (3 wells)	0.8	538	1,959	97%
City of Erie, Bureau of Water (Lake Erie)	88.0	45,656	185,000	61%

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(1) Each connection represents from 2.8 to over 4.0 people served. This ratio depends on the number of non-domestic customers and the extent of multi-family dwellings in the serving area.

Source: Ohio Department of Natural Resources and Pennsylvania Department of Environmental Resources, 1975 and 1976. Erie Metropolitan Planning Commission, Ashtabula County Planning Commission, and interviews with water supply system officials.

Table 2-222

Administrative/Operational Characteristics of Major Water Supply Systems in the Principal Study Area

Water Supply Systems	1975 Total Revenues (000 $)	1975 Operating Expenditures(1) (000 $)	Percent of Operating Expenses in Direct Salaries and Wages Including Benefits	Number of Employees		
				Total	Operation	Administration
Ohio						
Conneaut Water Department	317(2)	324	62%	17	11	6
Ashtabula Water Works Co.	2041	797	50	30	21	9
Ohio Water Service Co., Lake Erie Division	7725(3) (Estimated to be 695 for Ashtabula County)	4097(3) (Estimated to be 369 for Ashtabula County)	46	30(4) (Estimated to be 15 for Ashtabula County)	22	8
Pennsylvania						
Girard Borough Water Department	37	19	52	2	1	1
Lake City Municipal Water Works	39	25	51	2	1	1
Pennsylvania Water Co., Erie Suburban Div.	331	218	N/A	11	7	4
Fairview Borough Water Works	25	20	41	2	1	1
City of Erie, Bureau of Water	4165	2954	63	136	106	30

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(1) Does not include debt service or principal repayment

(2) 1974 figure.

(3) Total Ohio activity for 60,665 customers.

(4) Lake Erie District (includes Ashtabula and Lake County Service).

NA = Not Available.

Source: Ohio and Pennsylvania Public Utility Reports, Ashtabula County and Erie County Planning Commissions, and personal interviews with water supply managers.

each of the systems ranges from 17 to 30. Principal staff responsibilities include plant operation, distribution, system maintenance, pump maintenance and operation, and meter reading. Operating expenditures during 1975 ranged from $324,000 for the Conneaut Water Department to over $797,000 for the Ashtabula Water Works Company. The administrative and operating characteristics of the five major systems providing water to the Pennsylvania Coastal Communities is shown in Table 2-222. All of these systems have operating costs which are less than revenues generated by the facilities' sales. Most of the operating costs shown in the table are for wages and salaries. The number of employees at each of the systems ranges from two to 136. Operating expenditures during 1975 varied from $19,000 (Girard Borough Water Dept.) to over $2.9 million (city of Erie, Bureau of Water).

Physical Characteristics

2.350
System capacities for the three major suppliers of water are 3.0 MGD (Conneaut Water Department), 3.5 MGD (Ohio Water Service Company, Ashtabula Company only), and 9.9 MGD (Ashtabula Water Works Company). Other important physical characteristics of these systems including storage capacity, land area utilized by the system, number of miles of water main, and the range of water main sizes are depicted in Table 2-223. The Ohio Water Service which derives a portion of its water from non-Lake Erie surface water diversion has 58 miles of open reservoir storage. Onshore land area used for the three systems ranges from 5.0 acres to 10.0 acres with a total land use of 27.0 acres by the three systems combined. The ratio of land use to system capacity is 0.6 acres per MGD for the Conneaut Water Department, 0.8 acres per MGD for the Ashtabula Water Works Company, and 0.35 acres per MGD for the Ohio Water Service. Important physical characteristics of centralized water supply systems serving Pennsylvania Coastal communities are displayed on Table 2-223. Systems capacities range from 0.8 MGD (Fairview Borough Water Authority) to 88.0 MGD (city of Erie, Bureau of Water). The city of Erie System has water storage capacity of 75.6 MGD including 58.0 MGD of ground-level storage. Land area requirements of each system are as low as 1.5 acres and as high as 40.0 acres. Ratios of land use to capacity are between 0.5 acres per MGD (city of Erie, Bureau of Water) to 5.0 acres per MGD (Pennsylvania Water Company, Erie Suburban Division).

Water Rates

2.351
The Ohio Water Service Company has the highest rates of the three major water supply systems servicing the Ohio Coastal Zone Communities, while the lowest rates are charged by the Conneaut Water

Table 2-223

Physical Characteristics of the Major Water Supply System in the Principal Study Area

Coastal Communities Major Water Supply Systems	Present System Capacity (MGD)[1]	Storage Capacity (MGD)[2]	Approximate Land Area Used by the Water Supply System (Acres)	Miles of Water Main	Main Size Range
Ohio					
Conneaut Water Department	3.0	1.2	5.0	34	2"-20"
Ashtabula Water Works Co.	9.9	4.0	12.0	178	2"-20"
Ohio Water Service Co., Lake Erie Division	3.5 (5.5 mid-1978)	1.9 (68.0 open reservoir)	10.0	160 Total[3] (estimate 115 in Ashtabula County)	2"-20"
Pennsylvania					
Girard Borough Water Department	1.5	0.3	1.5	15	4"-8"
Lake City Municipal Water Works	1.9	0.1	1.5	20	2"-8"
Penn. Water Co., Erie Suburban Division	2.0	1.0	10.0	36	2"-16"
Fairview Borough Water Authority	0.8	0.1	1.0	15	2"-6"
City of Erie, Bureau of Water	88.0	75.6 (including 58.0 ground-level storage)	40.0	542	3/4"-54"

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(1) MGD = million gallons per day.

(2) Standpipe or elevated tank.

(3) 97 acres owned by Ohio Water Service Co. and 63 acres owned by Lake and Ashtabula Counties, operated by the Ohio Water Service Co.

Source: Ohio and Pennsylvania Public Utility Reports, Ashtabula County and Erie County Planning Commissions and interviews with water supply system officials.

Department. The cost for a single-family residence household which uses 8,000 gallons of water per month is listed by water supplier in Table 2-224 and the monthly cost for industrial and commercial customers using 25,000 and 500,000 gallons per month. Rates for industrial and commercial customers are presented in Table 2-225. The highest rates for residential water use of the five Pennsylvania Coastal Community systems are those charged by the Erie Suburban Division, Pennsylvania Water Company. Lake City Municipal Water Works has the highest industrial and commercial rates of the five systems. The rates charged by each of the five centralized water supply systems are shown in Tables 2-224 and 2-225, respectively.

System Descriptions

Conneaut Water Department

2.352
The city of Conneaut Water System is municipally-owned and obtains its water through an intake in Lake Erie about one mile offshore. The water treatment plant capacity is 3.0 MGD and at its rated capacity, the plant has a mixing chamber retention time of 20 minutes. Four gravity filtration filters are used with a rated capacity of 0.75 MGD. Chemical treatment of the water is accomplished using alum as a flocculant in addition to chlorination which is performed both before and after filtration. After filtration, the water supply passes through two covered settling basins which have a four hour retention period at the rated capacity of 3.0 MGD. Treated storage capacity totals 650,000 gallons (150,000 gallons in a ground level storage tank, and elevated storage of 500,000 gallons). The city of Conneaut has had a centralized water supply system since 1891. The present system was built in 1934 and is thus over 40 years old. About $2.3 million (1975 dollars) worth of refurbishing and rejuvenation effort is required in the near-term.* Should increased growth pressure occur earlier than anticipated, the need for repair and expansion of the facility could become critical. Seventeen full-time employees work for the Conneaut Water Department, including six meter readers and clerks (nonoffice personnel), six operators and repairmen at the plant, and five persons for repairs to the water distribution system and for installation of water mains.

Ashtabula Water Works Company, Ashtabula, Ohio

2.353
The Ashtabula Water Works Company is a private company and is a subsidiary of the American Water Works Company, Inc. The system serves a total population of 37,000 persons (based on 1975 data) and includes the city of Ashtabula, North Kingsville Village, Ashtabula Township, parts of Plymouth Township, parts of Saybrook Township, and

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*Personal communication, City Engineer of Conneaut, 11 August 1978.

Table 2-224

Typical 1977 Monthly Cost of Water for a Single-Family Household

Basis: 1977 Water Rates and 8000 Gallons Per Month Water Usage

Major Water Supply System	Monthly Cost ($)
Ohio	
Conneaut Water Department	$ 7.36
Ashtabula Water Works Company	13.87
Ohio Water Service Company, Lake Erie Division	18.55 (inside Geneva City and Jefferson Village) 21.73 (outside Geneva City and Jefferson Village)
Pennsylvania	
Girard Borough Water Department	4.67
Lake City Municipal Water Works	5.23
Pennsylvania Water Co., Erie Suburban Division	9.36
Fairview Borough Water Authority	4.70
City of Erie, Bureau of Water	
Flat rate customers -- within city (Assumes 1-family house, 1 full bath, 1 half bath, 3 bedrooms, 41' frontage, sprinkling.)	4.86
Metered customer -- outside Erie City	5.81

Source: Water rate schedules; Arthur D. Little, Inc. estimates.

Table 2-225

Typical 1977 Monthly Cost of Water for Commercial and Industrial Customers

Major Water Supply System	Monthly Cost ($)	
	25,000 Gallons/Month	500,000 Gallons/Month
Ohio		
Conneaut Water Department	$22.25	$287.40
Ashtabula Water Works Company	43.35	502.60
Ohio Water Service Company, Lake Erie Division	57.13	643.15
Pennsylvania		
Girard Borough Water Department	10.67	*
Lake City Municipal Water Works	16.15	*
Pennsylvania Water Company, Erie Suburban Division	16.11	*
Fairview Borough Water Authority	11.18	*
City of Erie, Bureau of Water	14.43	116.30

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*Not designed to service heavy industrial water use customers.

Source: Water rate schedules; Arthur D. Little, Inc. estimates.

parts of Kingsville Township. The system consists of a single treatment plant located along Lake Erie within the city of Ashtabula. Water is supplied from Lake Erie through 24-inch cast iron pipeline and a 30-inch prestressed concrete pipeline which both run approximately 3,000 feet into the lake. The treatment plant capacity is nominally rated at 9.9 MGD. The present annual average use is 5.0 MGD, or about 50 percent of the nominal capacity. The maximum use date of record was in July of 1963 when 7.7 MGD was distributed by the system. Presently, the total permanent staff is 30 persons and most of these are associated with plant operations and maintenance. Both water usage billing and sewer charges are the responsibility of the administrative staff. On the basis of service area population growth projections, there appears to be ample excess capacity to handle average peak loads through 1990. However, the company is aggressively marketing its service, and its rate of customer acquisition could be greater than that of the population increase projected for cities, villages, and townships currently served.

Ohio Water Service Company, Geneva, Ohio

2.354
The Ohio Water Service Company, Lake Erie Division supplies a number of villages and townships within Ashtabula County in addition to others within Lake County, Ohio. The total population served by the Ohio Water Service is over 35,000; between Jefferson Village and Jefferson Township over 4,000 customers are served by the company. Austinburg and Harpersville Township are also served by the Ohio Water Service Company. Most of the water is obtained by withdrawal from the Grand River south of the city of Geneva. Considerable storage capacity exists in the system including about two million gallons in closed water tanks and about 70 million gallons of open reservoir storage. This amount of storage is necessary due to the variable flow of the Grand River, particularly in summer months. Present delivery capacity is 3.5 MGD. This will be expanded to 5.5 MGD, after storage is made available and is around 3.3 MGD or 95 percent of current capacity. Projections of use and supply in 1980 and 1990 under present conditions suggest that even with the expansions in progress now, a slight deficit may occur by 1990. This assumes that the total system use increases on a per-capita basis proportional to the regional population projection. There is some argument that water usage will not increase as rapidly due to some rather sizable rate increases that have been recently instituted. Presently, Ohio Water Service Co. rates are considerably higher than other nearby water supply system rates; particularly the municipally-owned supply systems.

Springfield Township and East Springfield Borough, Pennsylvania

2.355
The water supply system of Springfield Township and East Springfield Borough consists essentially of individual wells and wells used for public buildings such as the East Springfield Elementary School. The Happy Valley Trailer Park has a central two-well system which presently yields only six gpm (i.e., much less than 0.01 MGD). At present, there is no public central water supply system anywhere in East Springfield Borough or the entire township of Springfield. Two alternatives directed toward the establishment of a water authority for Springfield Township and East Springfield Borough has been proposed by the Erie County Planning Commission including:

> Develop a centralized groundwater system using aquifers near the borough of East Springfield;
>
> Build a Lake Erie intake and centralized treatment plant in Springfield Township.

The first option is the least capital cost intensive. The second option would require much larger amounts of money in order to build and operate. The supply of groundwater is limited within the area, and the ability to obtain sufficient long-term supplies would have to be determined with a detailed hydrogeologic investigation.

Girard Borough Water Department, Girard Borough, Pennsylvania

2.356
Presently, the borough of Girard has a self-contained water supply system that serves nearly all the residents and does not serve any areas outside the geographic boundaries of the borough. Approximately 950 customers of the water supply system representing a population of around 2,600 are presently served. The Borough is supplied by groundwater from three dug wells, each with two 150-gallon-per-hour pumps. The estimated combined capacity of the three wells is about 0.65 MGD. It may be possible to pump water out at a faster rate, but at the cost of drawdown of the water level. Storage is supplied by two elevated tanks, one with approximately 100,000 gallons capacity and another with 166,000 gallons of capacity. All water is treated by chlorination at each well site. Present average consumption is about 0.28 MGD, and peak consumption is about 0.33 MGD. On this basis, Girard Borough seems to have a relatively adequate supply of water for baseline growth population. Most of the distribution system is four-inch pipeline, which presently is not adequate in certain areas of the town. In these areas, the four-inch pipeline is being replaced by eight-inch pipes in order to upgrade the system. Additionally, the water supply manager is pursuing a

policy of installing six-inch or larger diameter pipeline for all main extensions within the borough. About 23 percent of the water is used for industrial uses and 77 percent is for domestic uses.

Lake City Municipal Water Works, Lake City Borough, Pennsylvania

2.357
Lake City Borough has a centralized water system consisting of three wells with automated controls. Chlorination is accomplished at the well site. The estimated yield of these three wells is about 1.8 MGD which is considerably higher than the present use of 0.26 MGD. The system utilizes one elevated 100,000 gallon storage tank and the distribution system consists of six- and eight-inch mains most of which are between 45-55 years old. About 54 percent of the annual use is domestic and 46 percent industrial. According to projections, the Lake City Borough Water System is more than adequate to meet the water needs through 1990.

Fairview Borough Water Authority, Fairview Borough, Pennsylvania

2.358
Fairview Borough whose present population is less than 2,000 has a centralized water supply system which supplies over 90 percent of the Borough's needs and is owned by the Fairview Borough Water Authority. The system has three wells, the combined capacity of which is 0.8 MGD. Storage capacity totals 100,000 gallons. Present water use averages about 0.12 MGD or 15 percent of well capacity. The system, thus, appears adequate to handle the baseline population growth. About 97 percent of the use is domestic and only three percent industrial. The system consists of mains ranging in size from four inches to six inches. Expansion of the system would probably require the upgrading of existing mains. However, it is not expected that the Fairview Borough System will expand to meet the needs of the township. There is a possibility of greater delivery of city of Erie water into the Fairview township through the proposed Erie Metropolitan Water Authority. Presently, the Erie Suburban Water Company supplies up to 0.2 MGD of water to customers within Fairview township.

Millcreek Township, Pennsylvania

2.359
Millcreek township is a suburban community of about 42,000 persons which surrounds the western and southwestern boundaries of the city of Erie. Presently, Millcreek's water is supplied by three different sources, which include the Pennsylvania Water Company, Erie Suburban Division; the city of Erie, Bureau of Water; and individual private wells scattered throughout the township. The Erie Suburban Division

provides water to the township by reselling city of Erie, Bureau of Water supplies (about 0.3 MGD on the average) and by selling about 0.5 MGD of additional water from groundwater supplies in Millcreek township. The city of Erie, Bureau of Water also services a portion of Millcreek township as part of its PUC-defined boundary. The total public water supply to Millcreek Township is presently about 3.6 MGD. According to the manager of the Erie Suburban Division, the existing capacity of their system, including purchases from the city of Erie, is about 2.0 MGD. On the basis of projected Millcreek township growth, the Erie Suburban Division should have a surplus even through 1990. The assumption of surplus, however, is based on the fact that no existing residents will tie into the company's supply and that new residential construction is developed having individual water supplies in the same ratio as presently exists (about 25 percent). Out of approximately 42,000 residents, the Erie Suburban Division only supplies about 9,460 persons within the township. If the Suburban Division does find itself with increased requirements and cannot increase its supply above 2.0 MGD total, then the city of Erie will have to supply a greater amount of water to Millcreek township. In addition to just supplying the water demand, extensive main extension and booster pump construction would be required.

City of Erie, Bureau of Water, Pennsylvania

2.360
As noted earlier, the largest central water system in the Regional Study Area is the system operated by the city of Erie, Bureau of Water. The system consists of two new water intakes in Lake Erie situated on the western and eastern parts of the city. Each intake has its own treatment plant, and the combined capacity is 88 MGD. The total system presently serves about 185,000 customers including residents of the city and those outside the city in Wesleyville Borough, Lawrence Park Township, Harbor Creek Township, and Millcreek Township. Total system average daily use is about 44.1 MGD, of which the city of Erie accounts for 34.7 MGD. According to estimates, significant excess capacity exists through the year 1990. Again, these figures do not consider the possibility of adopting additional water supply responsibilities in Millcreek Township, Fairview Township, and other suburbs by the Bureau of Water System. Generally, with the exception of the Conneaut and Ohio Water Service Company systems, the water supply appears adequate for baseline projected uses. In all cases, increased use will be generally accompanied by increased requirements for mains and main extensions. Increased withdrawals and more extensive distribution systems require many additional booster pumps and storage at various locations. If there is a requirement for central water supply system expansion, the water treatment facilities, pumps, intakes, and other central equipment will probably have to be upgraded and augmented with additional equipment.

e) Characteristics of Other Water Supply Systems Within or Bordering the Principal Study Areas

Andover Village Water Supply, Ohio

2.361
The Andover Village water supply system presently supplies around 100 people. Present annual use is below capacity and will remain so under baseline projections. The supply system consists of three wells and is a direct pressure-gravity flow system with elevated storage. Water treatment consists of chlorination.

City of Orwell, Ohio

2.362
The water system in Orwell consists of groundwater supplies and has elevated storage capacity of 100,000 gallons. Delivery capacity exceeds demand both presently and for the future, assuming that water hookups will increase proportionate to baseline population. Even under Northeast Ohio Water Plan estimates, which project a higher degree of water use, the Orwell water supply system seems capable of supplying the baseline requirements.

Rock Creek Village, Ohio

2.363
The Rock Creek Village system supplies a population of about 750 with present average use below 0.1 MGD. The village obtains its water by withdrawal from the Grand River and pumping to an upground water storage reservoir. There are three drilled wells in the vicinity to provide auxiliary water when needed. Present treatment consists of chlorination. Storage consists of a 100,000-gallon elevated tank. As with the city of Orwell, Rock Creek Village appears to have adequate capacity to supply baseline projected needs.

Ridgefield Water Company, Millcreek, Pennsylvania

2.364
The Ridgefield Water Company serves a small area of Millcreek Township, and obtains its water from wells. Average daily withdrawal is about 0.02 MGD for a total of about 60 customers. Eventually, the system will be taken over by the city of Erie as the present water supplies are depleted.

Albion Municipal Water System, Erie County, Pennsylvania

2.365
The Albion Municipal Water System serves customers in Albion and Cranesville Borough and a few additional in Elk Creek and Conneaut

Townships for a total population of about 2,850. Average daily consumption is 0.16 MGD, of which about nine percent is industrial. The system is supplied by a network of dug and drilled wells. The present design capacity is about 0.6 MGD, and includes a two-million-gallon storage reservoir. However, Albion officials have advised that seasonal shortages occur requiring the importation of water from other sources. Under these circumstances, well production may not be able to keep pace with demand since pumps are only able to provide 120,000 gallons per day with the difference made up by gravity flow. The water distribution system is also antiquated and probably could not handle a demand greater than 160,000 gallons per day.

Edinboro Borough Water Authority, Erie County, Pennsylvania

2.366
The Edinboro Borough Water Authority obtains its water supply from three pumped wells, the total rated capacity of which is 3.6 MGD. Present consumption of the 5,100 residents served averages 0.6 MGD. Of this consumption, six percent is nonresidential. Total system storage is presently 500,000 gallons, and plans have been made to double this.

Springboro Water System, Crawford County, Pennsylvania

2.367
Springboro Water Supply system serves about 185 customers and provides an average supply of 0.025 MGD. The system is supplied by two wells each rated at 150 gallons per minute (0.4 MGD), storage is provided by a 50,000-gallon elevated tank.

Conneautville Water System, Crawford County, Pennsylvania

2.368
The borough of Conneautville operates a supply system sourced from two wells, each rated at 250 gallons per minute. The distribution system, originally developed in 1889, services 360 customers. Average demand is 0.1 MGD. A single standpipe is maintained with 473,000 gallons of storage.

Municipal Authority, Borough of Conneaut Lake, Crawford County, Pennsylvania

2.369
The borough of Conneaut Lake operates a well-sourced water supply system serving 250 customers. In the summer, the average use is 0.1 MGD, estimated capacity is 0.45 MGD. Presently available storage capacity is 25,000 gallons.

Oakland Beach Water Company, Crawford County, Pennsylvania

2.370
The Oakland Beach Water Company serves 95 customers in the winter and 400 in the summer. Average use in the summer reaches 0.3 MGD. Estimated capacity from the Conneaut Lake intake and filtration system is 0.4 MGD. The system has 270,000 gallons of storage.

f) Projections for Water Supply Systems in the Principal Study Area

2.371
The results of the baseline projections for municipal- and utility-owned central water supply systems in the Principal Study Area is presented in Table 2-226. The data were obtained from numerous sources, including reports by planning commissions and through individual contact with engineers and managers of local water supply systems. In the table, the "Present Average Use" includes total use by all users (including industry) and represents a 1975 or 1976 annual average figure. "Existing" capacity is the effective capacity of the system as nominally rated and is usually limited by one or more components. In some cases, when filtering treatment equipment is the limiting factor there is the possibility of greater levels of supply for short time periods of less than one day. "Per Capita Use" is average daily use by all customers divided by the population served. The peak use requirements are actual measured historical use levels, if available. For cases where the peak day use was not available, a factor of 1.5 times the annual average daily use was used to project the daily peak use. The average baseline uses in 1980 and 1990 were determined by scaling-up the additional use on the basis of the baseline population increase for the appropriate boroughs, townships, villages, and cities. Where other information indicated greater population increases or greater water withdrawal rates, an auxiliary use estimate, which was typically higher than the baseline projected estimates, was also supplied. On the basis of similar use characteristics, the estimated surplus or deficit capacity of each of the existing water supply systems was estimated. In most cases there is, on the basis of baseline population increase, a positive surplus of capacity existing in the water supply systems. Some of these baseline surplus estimates are probably higher than may occur because many water supply systems are taking on customers at a rate greater than the rate of population growth. This may be particularly true for the private utilities that are actively seeking to increase their market share and for boroughs that are entertaining any possibility of satisfying water users within the township outside of their own borough boundaries.

Sanitary Wastewater Collection and Treatment

a) Introduction

2.372
A municipal sewage system consists of the sewer network and associated pumping stations which transport the sewage from homes to the treatment plant which treats the sewage and the associated outfall which discharges the sewage to some receiving body of water. The status of existing municipal sewage service in the three-county region is summarized in Table 2-227. Data furnished include the estimated population served, average daily flow rate, design capacity of the treatment plant, the process employed in treatment and the receiving body of water are noted for each existing municipal system. The geographical extent of existing municipal sewage systems and proposed extensions service by the year 1990 under baseline conditions is shown in Figure 2-25. Except for the city of Conneaut, most of the existing sewage systems have oversized interceptor sewers to allow for expansion to neighboring areas. Plans have been formulated to expand existing facilities in the city of Conneaut, Ashtabula City, Lake City-Girard-Fairview (the Northwest Erie County Regional Sewer Authority), and the system serving Erie City metropolitan area. Although construction schedules have not yet been determined, it is probable that the proposed system expansions will be completed prior to 1990. Springfield Township and East Springfield Borough are the only communities close to the proposed steel plant site which are not planning sewage service by 1990. However, there is a possibility that this area will tie into the proposed Northwest Erie sewage system if development levels necessitate. Estimates of the cost of the proposed baseline expansions of four sewage systems in the Regional Study Area are presented in Table 2-228. The costs of interceptors include upgrading existing interceptors, construction of new interceptors and collector sewers and pumping stations. Local sewer construction is not included since it is generally provided by developers of new homes. Treatment plant costs are those associated with the expansion of existing facilities to achieve sufficient capacity to serve the projected 1990 baseline population. Since Federal grants may be available to cover 75 percent of the cost of interceptors and treatment plants, the local share of the construction costs is up to 25 percent of total costs. It is likely that sewer authorities will issue some form of bonds to finance the local portion of facilities costs. Payment of principal and interest would be funded by increases in sewer charges to users. Typical sewer charges are currently $5 to $15 per household per month. These revenues are applied against operating costs and repayment of principal and interest. Although operating costs per capita or per household are not expected to increase, debt service will increase due to new construction. If newly sewered homes are fully assessed for the principal and interest payments required for construction of interceptors and

Table 2-226

Water Supply Systems Baseline Information

Ohio	Present Population Served (1975-76)	Present Use Annual Avg: (MGD)	Existing Capacity (MGD)	Per Capita Use (gpcd) (Total) (Gal)	Peak Use Present (MGD)	Estimated 1980 Average Use (MGD)	Estimated 1990 Average Use (MGD)	Estimated Surplus/(Deficit) (MGD) 1980	Estimated Surplus/(Deficit) (MGD) 1990
Local Study Area									
Conneaut Water System	14,522	2.00	3.00	138	2.80	2.10	2.30	0.10	(0.20)
Principal Study Area									
Ashtabula Water Works Company (Total)	37,692	5.00	9.90	133	7.70	5.30	5.70	1.70	1.20
Ashtabula City	24,918								
North Kingsville	2,323								
Ashtabula Township	6,573								
Plymouth Township	806								
Saybrook Township	2,354								
Kingsville Township	718								
Ohio Water Service Company (Total)	35,855(1)	3.30	3.50(5.50 mid-1978)	92	4.70	3.60	3.90	0.60	(0.10)
Jefferson Village	3,823								
Saybrook Township	4,616								
Ashtabula Township	882								
Jefferson Township	289								
Andover Village	1,100	0.19	0.34	173	0.27	0.20	0.21	0.07	0.05
Rest of Region									
Ohio Water Service Co.	(See above)								
Geneva City	7,923								
Geneva Township	2,508								
Plymouth Township	274								
Harpersville Township	464								
Austinburg Township	403								
Orwell	930	0.11	0.32	115	0.16	0.12 0.14(2)	0.13 0.17(2)	0.14 0.11(2)	0.13 0.06(2)
Rock Creek Village	750	0.08	0.30	100	0.12	0.08 0.09(2)	0.08 0.11(2)	0.18 0.17(2)	0.18 0.13(2)

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(1) Includes other Villages and Townships in Lake County

(2) Northeast Ohio Water Plan estimates.

Table 2-226 (Continued)

Pennsylvania	Present Population Served (1975-76)	Present Use Annual Avg: (MGD)	Existing Capacity (MGD)	Per Capita Use (gpcd) Total) (Gal)	Peak Use Present (MGD)	Estimated 1980 Average Use (MGD)	Estimated 1990 Average Use (MGD)	Estimated Surplus/(Deficit) (MGD) 1980	Estimated Surplus/(Deficit) (MGD) 1990
Local Study Area									
East Springfield Borough	600	0.06	-	100	0.09	0.09	0.08	-	-
Springfield Township	2,500	0.30	-	100	0.40	0.40	0.40	-	-
Principal Study Area									
Erie County									
Albion Borough (Also including Cranesville Borough, Elk Creek Borough, and Conneaut Borough)	2,057	0.20	0.70	94	0.30	0.21	0.23	0.40	0.35
Edinboro Borough	5,271	0.60	3.80	121	0.90	0.60	0.70 0.80 (1)	2.90 2.80 (1)	2.80 2.60 (1)
Lake City Borough	2,290	0.26	1.86	114	0.40	0.29 (1)	0.35 (1)	1.43	1.36
Girard Borough	2,492	0.22		82	0.33	0.23 (1)	0.28 (1)	1.16	1.08
City of Erie, Bureau of Water (Total System) (City Alone)	185,000 117,000	44.10 34.70	88.00	253	72.0	45.90	49.00	13.20	8.13
Bureau of Water Supply To:									
Wesleyville Borough	3,980	0.30							
Lawrence Park Township	4,730	5.50							
Harbor Creek Township	12,797	0.50							
Millcreek Township	42,988	2.80							
Pennsylvania Water Co. Erie Suburban Division, (Millcreek Township)		0.3							

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(1) Based upon Erie County Planning Commission Projections

Table 2-226 (Continued)

	Present Population Served (1975-76)	1975-76 Use Annual Avg: (MGD)	Existing Capacity (MGD)	Per Capita Use (gpcd) (Total)	Peak Use Present (MGD)	Estimated 1980 Average Use (MGD)	Estimated 1990 Average Use (MGD)	Estimated Surplus/(Deficit) (MGD) 1980	Estimated Surplus/(Deficit) (MGD) 1990
Pennsylvania Water Co., Erie Suburban Division Total	11,500	1.0	2.00[1]	87	-	1.10	1.30	0.50	0.20
Millcreek Township	9,460	0.8	-	-	1.10	0.90	1.00	-	-
Fairview Township	2,040	0.2	-	-	0.30	0.20	0.30	-	-
Crawford County									
Conneaut Lake Borough	875	0.1 (summer)	0.45[2]	114	0.13	0.10	0.11	0.34	0.33
Conneautville Borough	1,260	0.1	0.36	-	0.14	-	-	-	-

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[1] Includes 0.3 MGD for City of Erie Bureau of Water

[2] With pump and storage development

Source: Ashtabula County Planning Commission, Erie Co. Planning Commission; Crawford County Planning Commission; Northeast Ohio Water Plan; interview with water supply system managers; Arthur D. Little, Inc. baseline population projections.

treatment plant which treats the sewage and the associated outfall which discharges the sewage to some receiving body of water. The status of existing municipal sewage service in the three-county region is summarized in Table 2-227. Data furnished include the estimated population served, average daily flow rate, design capacity of the treatment plant, the process employed in treatment and the receiving body of water are noted for each existing municipal system. The geographical extent of existing municipal sewage systems and proposed extensions service by the year 1990 under baseline conditions is shown in Figure 2-25. Except for the city of Conneaut, most of the existing sewage systems have oversized interceptor sewers to allow for expansion to neighboring areas. Plans have been formulated to expand existing facilities in the city of Conneaut, Ashtabula City, Lake City-Girard-Fairview (the Northwest Erie County Regional Sewer Authority), and the system serving Erie City metropolitan area. Although construction schedules have not yet been determined, it is probable that the proposed system expansions will be completed prior to 1990. Springfield Township and East Springfield Borough are the only communities close to the proposed steel plant site which are not planning sewage service by 1990. However, there is a possibility that this area will tie into the proposed Northwest Erie sewage system if development levels necessitate. Estimates of the cost of the proposed baseline expansions of four sewage systems in the Regional Study Area are presented in Table 2-228. The costs of interceptors include upgrading existing interceptors, construction of new interceptors and collector sewers and pumping stations. Local sewer construction is not included since it is generally provided by developers of new homes. Treatment plant costs are those associated with the expansion of existing facilities to achieve sufficient capacity to serve the projected 1990 baseline population. Since Federal grants may be available to cover 75 percent of the cost of interceptors and treatment plants, the local share of the construction costs is up to 25 percent of total costs. It is likely that sewer authorities will issue some form of bonds to finance the local portion of facilities costs. Payment of principal and interest would be funded by increases in sewer charges to users. Typical sewer charges are currently $5 to $15 per household per month. These revenues are applied against operating costs and repayment of principal and interest. Although operating costs per capita or per household are not expected to increase, debt service will increase due to new construction. If newly sewered homes are fully assessed for the principal and interest payments required for construction of interceptors and sewage treatment plants required to serve them, it is estimated that monthly sewer bill would amount to $5 to $16 per household.

Table 2-227

Existing Municipal Sewage Systems in the Regional Study Area

Area	Treatment Process	Estimated Population Served	Estimated Average Daily Flow (MGD)	Design Capacity (MGD)	Average Flow Per Capita	Receiving Water
Ashtabula County						
Conneaut	Activated Sludge	11,000	2.00	2.93	182	Lake Erie
Ashtabula City	Activated Sludge	25,000	4.00	12.00	160	Lake Erie
Geneva on the Lake	Contact Stabilization	1,000	0.25	0.42	250	Lake Erie
Geneva	Trickling Filter	6,800	0.85	3.00	125	Cowles Creek
Jefferson	Activated Sludge	3,000	0.45	1.00	150	Grand River Tributary
Andover	Extended Aeration	2,400	0.20	0.20	83	Pymatuning Reservoir
Orwell	Oxidation Ditch Extended Aeration	1,900	0.20	0.20	105	Grand River Tributary
Erie County						
Lake City	Trickling Filter	1,800	0.42	0.32	233	Elk Creek
Girard	Trickling Filter	3,000	0.35	0.44	117	Elk Creek
Albion	Trickling Filter	2,500	0.31	0.32	125	E.Branch Conneaut Creek
Erie City	Activated Sludge	175,000	55.00	65.00	314	Lake Erie
North East	Trickling Filter	4,000	0.65	2.10	163	Sixteenmile Creek
Edinboro	Contact Stabilization	7,500	0.60	1.00	80	Conneauttee Creek
Waterford	Trickling Filter	1,500	0.20	0.20	133	LeBoeuf Creek
Union City	Trickling Filter	4,000	0.80	0.50	200	S.Branch French Creek
Corry City	Trickling Filter	8,000	2.20	1.30	275	Hare Creek
Crawford County						
Springboro/ Conneautville	Secondary	1,500	0.15	0.31	100	Conneaut Creek
Linesville	Contact Stabilization	1,260	0.13	0.20	103	Linesville Creek
Conneaut Lake JMA	Trickling Filter	7,000	1.20	1.94	171	Conneaut Outlet
Conneaut Lake MA	Trickling Filter	745	0.14	0.14	188	Conneaut Creek
Cambridge Springs	Contact Stabilization	3,100	0.50	0.73	161	French Creek
Saegertown	None-Raw	3,000	0.30	—	100	Woodcock Creek
West Mead #2	Extended Aeration	3,800	0.50	0.52	132	French Creek
Meadville	Trickling Filter	18,000	3.00	3.90	167	French Creek
Fredricksburg	Extended Aeration	1,000	0.10	0.08	100	Cussewago Creek
Watson Run	Extended Aeration	644	0.07	0.12	100	Watson Run
Titusville	Trickling Filter	8,000	0.80	2.50	100	Oil Creek

Source: Pennsylvania Department of Environmental Resources-Draft COWAMP Report, 1976; field interviews by Arthur D. Little, Inc. staff.

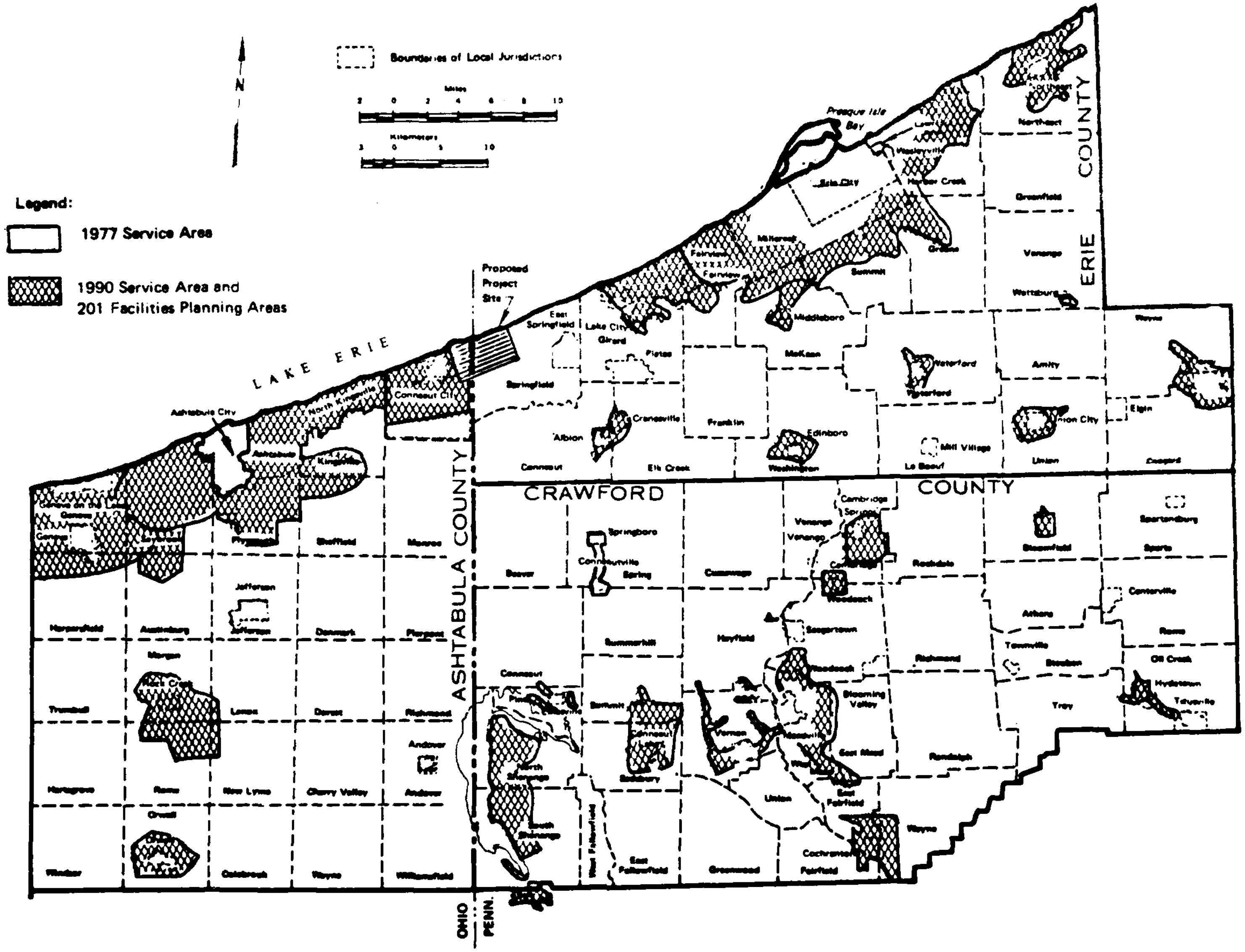

FIGURE 2-25 MUNICIPAL SEWAGE SERVICE AREAS IN THE REGIONAL STUDY AREA

Table 2-228

Estimated Total Construction Cost of Proposed Sewage Facility Expansions Under Existing Conditions (Millions of Dollars)

	Interceptors	Plant Treatment	Total	Local Portion of Total
Conneaut	$ 4.9	$ 0.0	$ 4.9	$ 1.2
Ashtabula Area	18.6	0.0	18.6	4.7
Northwest Erie County	10.5	7.5	18.0	4.5
Erie City Area	26.7	17.2	43.9	11.0

Source: Sanitary Wastewater Collection and Treatment Working Paper.

sewage treatment plants required to serve them, it is estimated that monthly sewer bill would amount to $5 to $16 per household.

b) Existing and Projected Conditions

Ohio Local Study Area

2.373
The Conneaut sewage system serves an estimated population of 11,000 in the more densely populated area of the city, bounded by Conneaut Creek on the east and south, Lake Erie on the north, and Parrish Road on the west. Most of the existing sewer network was constructed over 40 years ago and presently has high volumes of infiltration-inflow. There are four pumping stations in the sewer network which were constructed in the late 1950's. Each of the pumping stations has an overflow weir which permits flows that exceed the capacity of the pumps to overflow into Conneaut Creek or storm sewers leading to the Creek. Two of these pumping stations rarely overflow, however, one overflows during periods of heavy stormwater flow, and the fourth (Whitney-Madison) overflows on a daily basis during the normal work week between 10:00 a.m. and 4:00 p.m. Estimated peak sewage flow, exclusive of infiltration-inflow, at the Whitney-Madison station is 235 gpm, which is 85 gpm greater than the 150 gpm rated capacity of the ejector station. (2-43) Average sewage flows for the Conneaut system in 1974 and 1975 were 2.0 MGD. Based upon an estimated sewered population of 11,000, the average daily per capita flow was 182 gpcpd (gallons per capita per day), which is rather high. Industrial wastewater accounts for approximately 34 percent of the total sewage flow. Infiltration-inflow is estimated to account for 96 gpcpd based upon studies of water pumpage records. The Conneaut sewage treatment plant has an average capacity of 2.93 MGD and a peak capacity of 7.30 MGD. The primary plant was upgraded to a secondary treatment plant using the activated sludge method during 1973. The treatment facility is located on the Lake Erie (Conneaut Harbor) waterfront north of Park Avenue and west of Harbor Street and occupies a site approximately 325 feet in width (east to west) and from 720 feet in length on the east to 397 feet in length on the west. The plant discharges to the mouth of Conneaut Creek, near the marginal berths operated by the Pittsburgh and Conneaut Dock Company for limestone carriers. Due to high volumes of infiltration-inflow during periods of heavy rain, peak flows exceeding 7.5 MGD (meter recording limits) have occurred for several hours on multiple occasions at the sewage treatment plant. (2-41) A facilities plan for Conneaut is being developed by Hale Associates of Columbus, OH, which will demonstrate the most feasible means for adding new truck sewers in areas presently unsewered. The areas in which new sewer construction is most probable include all land north of Interstate Route 90 and a small area of Conneaut south of I-90 along Furnace Road and Baldwin Road. Construction of the initial portion of the East

Conneaut interceptor could begin in 1977 depending on the availability of funds. A consulting engineering firm, Woodruff, Inc., of Cleveland, Ohio, is assisting the city in its attempt to obtain a Federal grant, either from the Economic Development Administration (EDA) or the Environmental Protection Agency (EPA). EDA recently turned down a $570,000 grant request for the East Conneaut project for the second time in 1977, and Conneaut is reportedly No. 235 on the Ohio EPA priority list. (2-42) The part of the city west of the presently sewered area is the next most likely area for sewer development. Development of the remainder of the East Conneaut Sewer District could occur simultaneous to that of the western area. Those portions of the city to the south and east of Conneaut Creek will probably be sewered last because of comparatively sparse development.

Pennsylvania Local Study Area

2.374
Springfield Township and East Springfield Borough have no sewage service. On-lot disposal of sanitary wastes is accomplished through individual septic tanks. The Talarico Truck Stop and Ashland Service Station have small packaged extended aeration plants with capacities of 8,000 gpd and 3,000 gpd, respectively. At present, Springfield Township and East Springfield Borough are not planning to provide sewage service. As a result, future development of this area could be limited by a lack of sewage facilities. Without a municipal sewage system, it is likely that developers would be required to use packaged treatment plants to serve residential and commercial developments where the soil is unsuitable for septic tanks. If Springfield and/or East Springfield Borough were to develop a sewage system, at least two basic alternative treatment options are available: build and manage an independent treatment plant, or tie into the proposed Lake City-Girard-Fairview system. At present, it is impossible to determine when and if municipal sewage service will be available, and whether Springfield-East Springfield would elect to tie into the Lake Northwest Erie system. Under baseline conditions, it is unlikely that the area would need to install sewer because of the moderate rate of growth expected in its relatively small population.

Ohio Principal Study Area

2.375
Ashtabula City operates an activated sludge treatment plant with a capacity of 12 MGD that discharges through an outfall to Lake Erie. Phosphorus removal is provided after secondary treatment. The plant serves an estimated population of 25,000 in Ashtabula City and a small, contiguous portion of Ashtabula Township. The average flow is only four MGD or 160 gpcpd, so only one of the two 6-MGD streams is in operation. Approximately 10 percent of the total flow is

industrial wastewater. The older portion of the city has combined sewers; and to prevent flooding of cellars, a bypass valve is opened during storms allowing the combined sewer flow to discharge into the Ashtabula River. Extension of service to a larger area is now under consideration. In June 1977, the USEPA funded a Step 1 Facilities Plan study for the area which will be performed by Engineering Science, Inc., of Cleveland. Most of Saybrook and Plymouth Townships in this proposal would be included and is possible that North Kingsville Village could also be added to the Ashtabula sewage system. Expansion of the existing sewage system into these communities is feasible in view of the available excess capacity of the Ashtabula sewage treatment plant. If approvals by Federal agencies proceed quickly and favorably, contruction of extensions could begin in 1980. Due to poor drainage and impermeable soil conditions many of the onlot septic tanks are not functioning properly in the developed areas adjacent to Ashtabula City.

Pennsylvania Principal Study Area

Lake City-Girard-Fairview Area

2.376

Currently, Lake City and Girard each operate their own sewage collection systems and treatment facilities. The treatment plants in both communities are relatively old and are operating at or beyond design capacities. Both facilities provide secondary treatment and discharge treated effluents to Elk Creek. The Lake City system serves an estimated population of 1,800, while the Girard system serves an estimated population of 3,000. There is currently no municipal collection or treatment system in Fairview Borough. The Northwest Erie County Regional Sewer Authority whose members include: Lake City, Girard Borough, Girard Township, Fairview Borough and Fairview Township, is currently awaiting Federal funding for study of a regional sewage system. However, if the Authority follows the recommendations of the COWAMP study, the existing Lake City and Girard interceptors would become a part of a larger network encompassing the northeastern portion of Girard Township and the northwestern portion of Fairview Township including Fairview Borough. The two existing sewage treatment plants would be phased out when a new treatment plant having an initial capacity of 1.9 MGD is constructed along Lake Erie at the mouth of Elk Creek. In addition, nine nonmunicipal plants and five industrial plants could be phased out and serviced by the regional system. The COWP study recommended a 2,000-foot outfall for the plant, and that the facilities be constructed between 1975 and 1980. However, it appears unlikely that this schedule can be met, construction is a possibility for the 1980-1985 period.

Erie City Area

2.377
The Erie City sewage treatment plant currently serves an estimated population of 175,000 in Erie City, Lawrence Park, Wesleyville, and portions of Millcreek Township. The plant has a capacity of 65 MGD (after an expansion from 45 MGD in 1974), and treatment is accomplished by the activated sludge method followed by phosphorous removal. Plant effluents are discharged to Lake Erie through an outfall over 10,000 feet long. Average flow, including industrial wastes which account for about 40 percent of the total flow, is estimated to be 55 MGD or 314 gpcpd. Most of the sewers in the city of Erie are combined sewers, and overflows occur regularly during periods of rainfall. The combined sewer problem has been studied and several alternative plans have been proposed, all of which would be very expensive. A consulting firm, Dalton, Dalton and Little, Inc. estimated that approximately $50 million (1974 dollars) would be required to construct rock tunnels, interceptors, storm drains, holding basins, and pumps. Combined wastewater would be stored in holding basins and released to the treatment plant after storms and to accommodate this extra flow, the treatment plant would have to be expanded. The study may be updated in the near future, but it is unlikely that construction will occur unless funds become available. The COWAMP plan proposes expansion of interceptors to the northeastern portion of Fairview Township including the remainder of Millcreek Township not yet sewered, and portions of McKean, Summit, Greene, and Harborcreek Townships. Existing interceptors in Erie City would require reinforcements to transport additional flow from outlying areas to the treatment plant. Eventually, expansions in the treatment plant would be required to handle* additional flow. Under the COWAMP plan, three municipal treatment plants serving subdivisions in Fairview and Harborcreek Townships could be phased out as well as 20 nonmunicipal plants and 10 industrial plants (although some industries could find it more cost-efficient to continue operation of their own plants). The three existing municipal treatment plants which could be phased out are as follows:

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*Draft Final Report of the Comprehensive Water Quality Management Study of the Pennsylvania Portion of the Erie Basin and the Remaining Portion of Erie County, Feb. 1976, Pennsylvania Department of Environmental Resources

Facility-Location	Population Served	Treatment
Greenbrier Hill - Fairview	300	Extended aeration
White Swan Subdivision - Fairview	280	Extended aeration
South Shore Service - Harborcreek	600	Contact stabilization

Albion-Cranesville Area

2.378
Albion Borough operates a small trickling filter plant with a capacity of 0.32 MGD which serves an estimated population of 2,500 in the more developed portion of the Borough. The plant discharges to Conneaut Creek. The COWAMP plan recommends that sewer service be extended to Cranesville Borough and contiguous portions of Elk Creek and Conneaut Townships. The existing treatment facility will require expansion in the near future and ammonia and phosporous removal capability will be required.

The Remainder of the Regional Study Area

Ohio

2.379
In Ashtabula County, the village of Jefferson operates an activated sludge plant with a capacity of 1.0 MGD. No plans for expansion are currently under consideration. The village of Andover operates an extended aeration plant with a capacity of 0.20 MGD, and no plans for expansion are being considered. The city of Geneva operates a trickling filter plant with a capacity of 3.0 MGD, and Geneva-on-the-Lake operates a contact stabilization plant with a capacity of 0.42 MGD. Expansion to a regional sewer district including the remainder of Geneva Township and small portions of Harpersfield, Saybrook, and Austinburg Townships in the vicinity of the junction of I-90 and S.R. 45 are considering a sewage system. The village of Rock Creek, including portions of Morgan, Rome, Lenox, and New Lyme Townships, has applied for Federal funding of a new sewage system. A private development in the central part of Ashtabula County, Roaming Rock Shores, operates its own system. The village of Orwell operates an oxidation ditch with extended aeration having a capacity of 0.20 MGD. Orwell is considering extensions of service to adjoining areas in Orwell Township.

Pennsylvania

2.380
In Erie County, North East Borough operates a 2.10 MGD trickling filter plant. The COWAMP study recommended extension of service to

other areas of Northeast Township. Similarly, Edinboro, Waterford, Union City, and Corry City now operate sewage systems, and extensions to adjoining areas are proposed in the COWAMP study. A new sewage system is also proposed for McKean and surrounding portions of McKean Township. In Crawford County, Springboro and Conneautville recently constructed a sewage system with a secondary treatment plant of 0.315 MGD capacity. North and South Shenango are in the process of applying for Federal funding for a new sewage system adjoining Pymatuning Reservoir. Linesville is considering a small extension of its existing system. Three separate sewage systems serving portions of the area surrounding Conneaut Lake are considering consolidation and expansion of service to the whole lakefront. A number of sewer authorities exist in the Meadville-West Mead-Vernon area, and expansion of service to adjoining areas is under consideration. Saegertown has a sewer network, but discharges wastes untreated. This community will begin construction at a treatment plant in the Spring of 1978 which will service portions of Hayfield Township and Woodcock Township. Blooming Valley Borough will eventually initiate a facilities planning study in 1978 and may decide to tie new sewers into the Saegertown system. Cambridge Springs may expand its existing sewage system to adjoining areas, and Woodcock may construct a new system. Cochranton may construct a new system that would also serve adjoining areas. Bloomfield is considering a new system, and Titusville may extend the existing system to Hydetown.

Stormwater Drainage Facilities

a) Agencies, Regulations and Responsibilities

Ohio Regional Study Area

2.381
Storm drainage facilities in Ashtabula County are all owned and maintained by individual municipalities except as follows:

Drainage facilities associated with State or Federal highways (and therefore under the jurisdiction of the State of Ohio, Department of Transportation);

Drainage facilities associated with county highways (and therefore under the jurisdiction of Ashtabula County);

Private facilities (e.g., the drainage ditches adjacent to the Conrail tracks); and

Township and County ditches, theoretically maintained by assessment through a petition procedure outlined in Ohio drainage laws.

Generally, the responsibilities for maintenance of storm drainage facilities and for street maintenance lie in the same department in Ashtabula County. The unincorporated townships may utilize County equipment and crews in their maintenance programs. Ashtabula County subdivision regulations, which apply in unincorporated areas, require that provisions for stormwater drainage must be made in any subdivision, although storm sewers per se are not required. The developer must design and construct the drainage system, subject to the approval of the Ashtabula County Planning Commission, the County Engineer, and in land subject to periodic flooding, the Ashtabula County Board of Health. The Township Trustees may also make recommendations. In those incorporated cities and villages with local subdivision regulations, local approval is required, subject to County review but not approval. The city of Conneaut subdivision regulations require that new developers install storm sewers in multi-family districts, business districts, industrial districts, and single-family home districts with lot widths less than 80 feet. In developments without storm sewers, other provisions for stormwater drainage must be provided. Developers must tie into a storm sewer system if one is available. Storm drainage plans in the city of Conneaut are subject to the approval of the City Engineer.

Pennsylvania Regional Study Area

2.382

Stormwater drainage facilities in Erie and Crawford Counties are all owned and maintained by individual municipalities with the following two exceptions:

> Drainage facilities associated with State or Federal highway (and therefore under the jurisdiction of the Commonwealth of Pennsylvania, Department of Transportation); and
>
> Private drainage facilities (e.g. the drainage ditches adjacent to the Conrail tracks).

Generally, the responsibilities for maintenance of storm drainage facilities and for street maintenance lie in the same municipal department. The Erie County subdivision regulations require that all new developments in the County be serviced by separate storm sewers designed and constructed by the developer. In the past two years, approximately 25 percent of the subdivisions of Erie County have been drained only by curb flow or open ditching. Those that were storm drained were primarily the larger subdivisions in Fairview, Girard, and Millcreek. The present practice in Erie County is to require storm sewers only in the larger subdivisions or in the more urbanized

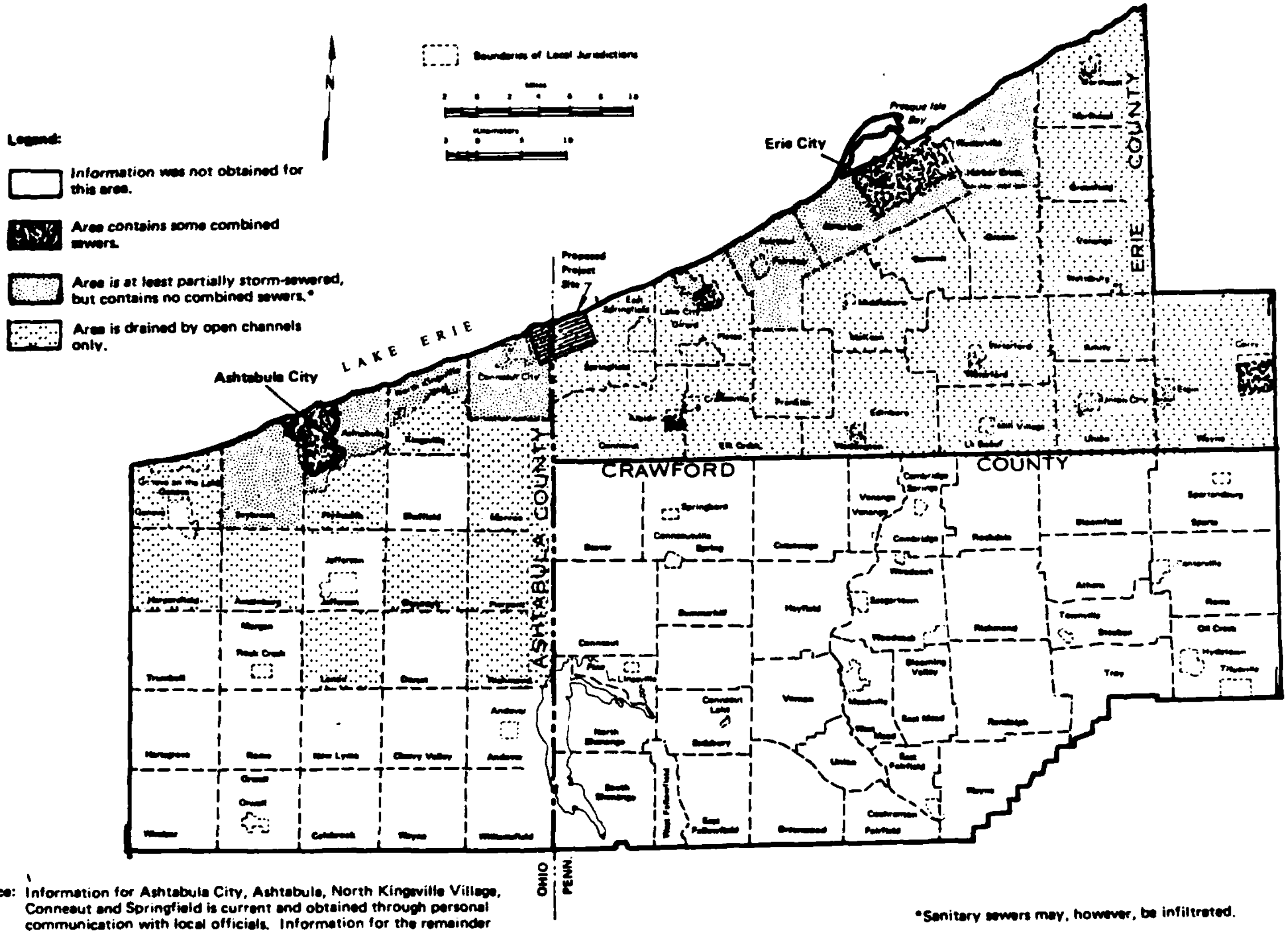
municipalities with rigid local subdivision regulations. In the Coastal Communities between Springfield and Erie City, the requirements for storm sewers in new developments are being enforced in Fairview Borough, Lake City Borough, Millcreek, and the city of Erie. For those areas without local subdivision regulations the Erie Metropolitan Planning Department has approval power for subdivisions; however, with respect to storm sewers, the advice of the Erie County Department of Health is followed. In areas with local regulations, the power of approval lies at the local level, with the County having the power of review. Subdivision regulations in Crawford County, unlike those in Erie County, do not require storm sewers in new developments, although plans for downwater drainage are required.

b) Present and Planned Capacity

2.383
Stormwater drainage in the Regional Study Area is generally limited by the prevalence of impermeable soils and lack of topographic relief. In the more rural areas, the drainage network consists of streams, rivers, and open ditches. In the more developed areas, storm sewers have been required to prevent the flooding of valued land. Some of the older, urbanized areas, including parts of Ashtabula City and Erie City, are partially serviced by combined storm and sanitary sewer systems. In other urbanized areas, including the city of Conneaut, stormwater runoff may infiltrate into the separate sanitary sewer system. The municipal storm drainage networks found in the Regional Study Area are shown in Figure 2-26. Stormwater runoff entering combined or infiltrated systems may be treated with the sanitary sewage at local sewage treatment plants. Generally, however, stormwater runoff is allowed to enter the local watershed untreated. Maintenance of the stormwater drainage network primarily consists of the cleaning of settled matter from pipes, catch basins, and ditches. The local and county maintenance departments in the Regional Study Area rarely practice preventive maintenance and instead concentrate their efforts on known drainage problems.

Ohio Local Study Area

2.384
The problems faced by the city of Conneaut with respect to stormwater drainage are fairly severe. In Conneaut, approximately 25 percent of the 112 miles of local streets is fully paved. The paved streets are also curbed and equipped with storm sewers. The storm-sewered area is in the center of town and occupies approximately 20-25 percent of the area of the City. Many areas without storm sewers, such as North Conneaut, East Conneaut, and Amboy, do require them. (2-43) However, the city of Conneaut has no comprehensive map of the city's drainage



Source: Information for Ashtabula City, Ashtabula, North Kingsville Village, Conneaut and Springfield is current and obtained through personal communication with local officials. Information for the remainder of Ashtabula County is from the 1969 Burgess and Niple Report, *Ashtabula County; Study of Present Storm Drainage Problems and Recommendations.* Information for the remainder of Erie County is from the 1974 *Erie County Storm Drainage Plan*, prepared by the Erie Metropolitan Planning Department.

*Sanitary sewers may, however, be infiltrated.

FIGURE 2–26 MUNICIPAL STORM DRAINAGE NETWORKS IN THE REGIONAL STUDY AREA

system and as a result, effective planning of drainage system improvements is very difficult. To counteract this problem, Conneaut has applied for 701 planning funds from the Department of Housing and Urban Development (HUD) to map the storm sewer system, but to date, funding has not been provided. Although none of the sewers in Conneaut are combined by design, over one-half of the flow in the sanitary system is due to infiltration, largely through leaky sanitary sewer manholes. Some flooding has been noted in the storm-sewered portions of the City. The major flooding problem as cited by the City Engineer has been at the corner of Depot and Chestnut Streets. (2-44) Storm sewers are presently needed in the North Conneaut, East Conneaut, and Amboy sections of Conneaut City. Severe flooding with water up to the front doors of the houses was reported two years ago in North Conneaut. The roads in these areas are either dirt, gravel, or tar and chip; and the installation of storm sewers on these roads would likely parallel road improvement. Conneaut currently spends about $50,000 per year on stormwater drainage in the City, primarily to maintain existing facilities or replace broken lines. Responsibility for the maintenance of storm sewers rests with the Streets Department, which is operating at full capacity. The Department presently employs 21 people and takes on five to seven part-time workers in the summer to help with road repairs. Although the department is reasonably well-equipped, a 13-16 cubic yard vacuum cleaner has been ordered to facilitate the cleaning of catch basins and storm sewer lines.

Pennsylvania Local Study Area

2.385
Springfield Township has no stormwater drainage infrastructure other than ditching and culverts, a system that is adequate according to the 1974 Erie County Storm Drainage Plan. In this plan, nearly 75 percent of the boroughs and townships in Erie County were judged likely to have potential storm drainage problems in the next 10 years. Springfield Township was not considered a potential problem area due to its low growth potential. Recent maintenance by the State has reduced a flooding problem at the junction of U.S. Routes 5 and 20. However, inadequate maintenance of culverts and open ditching on Conrail property continues to result in flooding during periods of heavy rains. Currently, Springfield Township has no local subdivision regulations, and storm sewers are neither required nor expected in new developments. County subdivision regulations requiring storm sewers in new developments have not been enforced in this area. Maintenance of the 60 miles of local roads and associated drainage is reported to be excellent by residents of Springfield. (2-45) The Township owns sufficient equipment for its present needs. Generally, additional manpower is required during the spring and winter for road and ditch maintenance and temporary employees are hired.

Ohio Regional Study Area

2.386
Although some of the urban centers in Ashtabula County have a well-developed storm sewer network, most of the unincorporated areas of the County have few, if any, storm sewers nor are they required in new developments under the County subdivision regulations. Some of the older areas, including Ashtabula Township and Ashtabula City, have combined storm and wastewater sewers. The most recent storm drainage study for the unincorporated parts of the County concluded that most of the County's drainage problems resulted from improper ditch maintenance. (2-46) Recent efforts by the County to alleviate this problem, including a $100,000 per year ditch cleaning program, have been successful. In the opinion of the County Engineer, improper ditch maintenance no longer poses a problem in Ashtabula County. (2-47) A major problem throughout the area is the drainage of septic tanks into open ditching. This situation constitutes a health hazard, creates unpleasant odors, and may contribute to or cause surface water pollution. The Ashtabula County Highway Department is responsible for County maintenance of storm sewers or open ditching. In the opinion of the County Engineer, they are well-equipped and operating within capacity limitations. (2-47) In addition to maintaining township and County ditches and storm sewers, the Department offers a number of services including the occasional lending of equipment to unincorporated townships, and the supplying of labor to landowners who are installing driveway culverts or who desire to tile the roadside open ditching adjacent to their property. The landowner must supply materials. Ashtabula City is the most intensely developed area in the County. Stormwater runoff in the city drains either into the Ashtabula River or directly into Lake Erie. The storm sewers in Ashtabula City are operating at capacity, with some flooding in heavy storms. In addition to a strained capacity, low topographic relief is a major cause of the present drainage problems in Ashtabula. The city basically consists of three plateau areas, each plateau varying in elevation by only five to ten feet. The sewers in each area are nearly flat-grade and even though they are large, they cannot handle heavy flows without backup. Ashtabula City also contains some combined sewers which the city plans to separate when funds become available.

Pennsylvania Regional Study Area

2.387
Much of Erie and Crawford Counties, including East Springfield Borough, Girard Township, and Platea Borough is very similar to

Springfield Township. As of May 1974, these areas had no storm sewers and were drained by open ditches and culverts. (2-43) As in Springfield, local maintenance is generally considered excellent. (2-48) In some of the more developed areas, including Lake City Borough, Girard Borough and Fairview Township, storm sewers are used and are required for new subdivisions under the local subdivision regulations. Both Girard Borough and Albion Borough have some combined sewers; in Girard, the combined system is a major drainage problem. This Borough has spent over $200,000 since 1957 to correct the situation. Erie is partially served by a combined system that is gradually being phased out as regions of the city are renewed. Subdivision regulations in the city of Erie require separate storm sewers for all new developments. Development is still occurring, however, in nearby Millcreek, as in Erie, local subdivision regulations have required the installation of storm sewers in new developments. To date, development in Millcreek has occurred thus far in an area that drains directly into Lake Erie, but future development is expected to extend into the Walnut Creek drainage basin. Millcreek spends approximately $100,000 per year on storm sewer maintenance and replacement and cleans and inspects the storm drainage facilities regularly. Municipalities in this region are at different stages in the development of storm drainage master plans. In Crawford County, no planning has been done on the County level, since most of the area is rural and has few perceived problems. In Erie County, local problems such as undersized culverts, sedimentation, and overburdened combined or infiltrated systems were identified. (2-43) Some localities with high growth potential were advised to conduct local drainage studies. Separate planning studies have been conducted for Millcreek and Erie City. (2-49, 50)

c) Financing

2.388
Presently, there are several sources of funding outside of the capital budgets of the county or the municipalities which may be used for general construction or reconstruction of storm sewage systems. The most traditional source of funding is the liquid fuel tax allocations from the State to the counties and municipalities. Erie County allocates 100 percent of its share of liquid fuel tax revenues to the various municipalities on a reimbursement basis. Another source of monies applicable to storm sewer construction and reconstruction falls under General Revenue Sharing. However, a wide variety of other municipal improvements are also subject to consideration for revenue sharing. Therefore, the available monies may be spread too thinly to be effective for yearly improvement schedules. There is no Federal funding available exclusively for the purpose of storm drainage improvements. However, under the Federal Water Pollution Control Act Amendments, P.L. 92-500, up to 75 percent Federal (EPA)

funding is available to municipalities with combined sewer or infiltration problems. Funds are provided for infiltration/inflow studies and for both the planning and construction phases of separation projects. All eligible projects must be preceded by an infiltration/inflow analysis. No Federal funds are available for maintenance purposes. Under the Rural Development Act, administered by the Farmers Home Administration, low interest loans are available to counties and municipalities for storm sewer, water works, or sanitary sewer improvements serving a maximum population of 10,000. The priority for the funding is based on improvement of the economic condition of the area, creation of additional jobs, and retention of existing jobs. In addition to the above program of adequate storm sewers is an eligible cost under both the Urban Renewal Programs of the Department of Housing and Urban Development and the Site Development Loans program of the Farmers Home Administration.

Solid Waste Collection and Disposal

a) Systems Providing Service

2.389
In the Principal Study Area, solid waste management is practiced by State, county, municipal, and private subsystems. The State is responsible for planning and permitting of sanitary landfills, the county for monitoring of sanitary landfills, the municipality for solid waste collection and zoning, and the private sector for solid waste collection and disposal. Private Contractors handle most of the solid waste collection in the Principal Study Area, and operate all of the solid waste disposal facilities. Every Coastal Community except Ashtabula City and Millcreek Township is serviced by private Contractors who operate in an open-competitive market, with little governmental regulation. Under this organizational structure, a private Contractor arranges with residential, commercial, and institutional customers the frequency of solid waste collection, pickup point, and fee. Additionally, the private sector owns and operates the three permitted sanitary landfills and two of the three transfer stations in the Regional Study Area. Ashtabula City is the only municipality in the Principal Study Area engaged directly in the collection of solid wastes. Three-member crews usually collect wastes once a week at curbside from residences although special arrangements are made in hardship cases (e.g., elderly, handicapped). The collection frequency for commercial and institutional units is as much as five days a week. For residences, the service is included in the city income tax. Commercial and institutional units pay a monthly fee of $10 for service. In each ward of the city, there is one Cleaning Week per year, when waste pickup (including bulky waste -- stoves, bed springs, refrigerators) is free. Ashtabula City also operates a transfer station. Millcreek Township residential solid

waste collection is accomplished through contract with a private firm. The Contractor serves residential communities weekly and supplies containerization service for commercial and institutional establishments. In the more rural sections of the Regional Study Area, the operation of private Contractors is negligible. Generally, citizens collect and dispose of wastes themselves, either on their own property or on the nearest authorized dump site.

b) Means of Collection and Disposal

2.390
The solid waste collection procedures for the various coastal communities are summarized in Table 2-229.

Collection in the Local Study Area and Coastal Communities

Ohio
2.391
In Conneaut City, residential, commercial, and institutional establishments arrange for collection service with private Contractors. Specific arrangements may vary since they depend solely upon the Contractor-customer agreement. Presently, four or five private haulers pay an annual fee of $100 to the City Health Department to operate within the city limits.

Pennsylvania
2.392
In the Springfield area, the amount of waste collection is minimal. A few citizens arrange for service with private haulers who are not required to be licensed by the township. Generally, citizens dispose of waste at an open-dump authorized by the Erie County Solid Waste Authority but not permitted by the State. To gain access to this facility, citizens simply present a driver's license (for proof of residency in the township), to the watchmen on duty. The dump is open on alternate Saturdays; no garbage (i.e., food waste) is allowed. It is estimated that less than five tons of refuse and trash are disposed at the site monthly. Table 2-229 summarizes collection information for the Coastal Communities.

Disposal in the Regional Study Area

2.393
Presently, there are three sanitary landfills serving the entire Regional Study Area, those are the New Lyme and Doherty facility in Ashtabula County, and the Lakeview area in Erie County. The locations of these landfills are shown in Figure 2-27. These privately-owned and operated facilities are permitted by the State, and are subject to local zoning regulations and County inspections. Over the

Table 2-229

A Description of Solid Waste Collection Procedures in the Coastal Communities

Community	Description
Kingsville Township and Village	Citizens in the area contract with private contractors.
Ashtabula and Saybrook Townships	Collection arrangements are contracted with private license contractors. Two to three companies operate and charge citizens $15 per month.
Girard Township and Borough	All waste collection arrangements are made with private contractor in Girard and surrounding areas. Fee charges are arranged between contractor and citizen.
Fairview Township and Borough	Two to three private contractors collect waste as necessary in the Township. In the Borough, private contractors collect waste employing the tag system; i.e., the contractor collects only waste marked by colored tags previously issued to the citizen.
Millcreek Township	The Township contracts with one company. The town government collects the revenue and pays the private firm. Collection costs for citizens may vary with residential location. Typically, a fee of $10 is charged quarterly. Roughly two cans per week are collected from residences.
Ashtabula City	The City has municipal collection. For residences, the service is included in the income tax. Commercial and institutional units pay a $10 monthly fee for service.
Conneaut City	Citizens and businesses contract with private haulers.
Springfield Township	Citizens generally haul their own trash to an open dump. A few private haulers are used.

Source: The Department of Health in Ashtabula City, Ashtabula County, and Erie County.

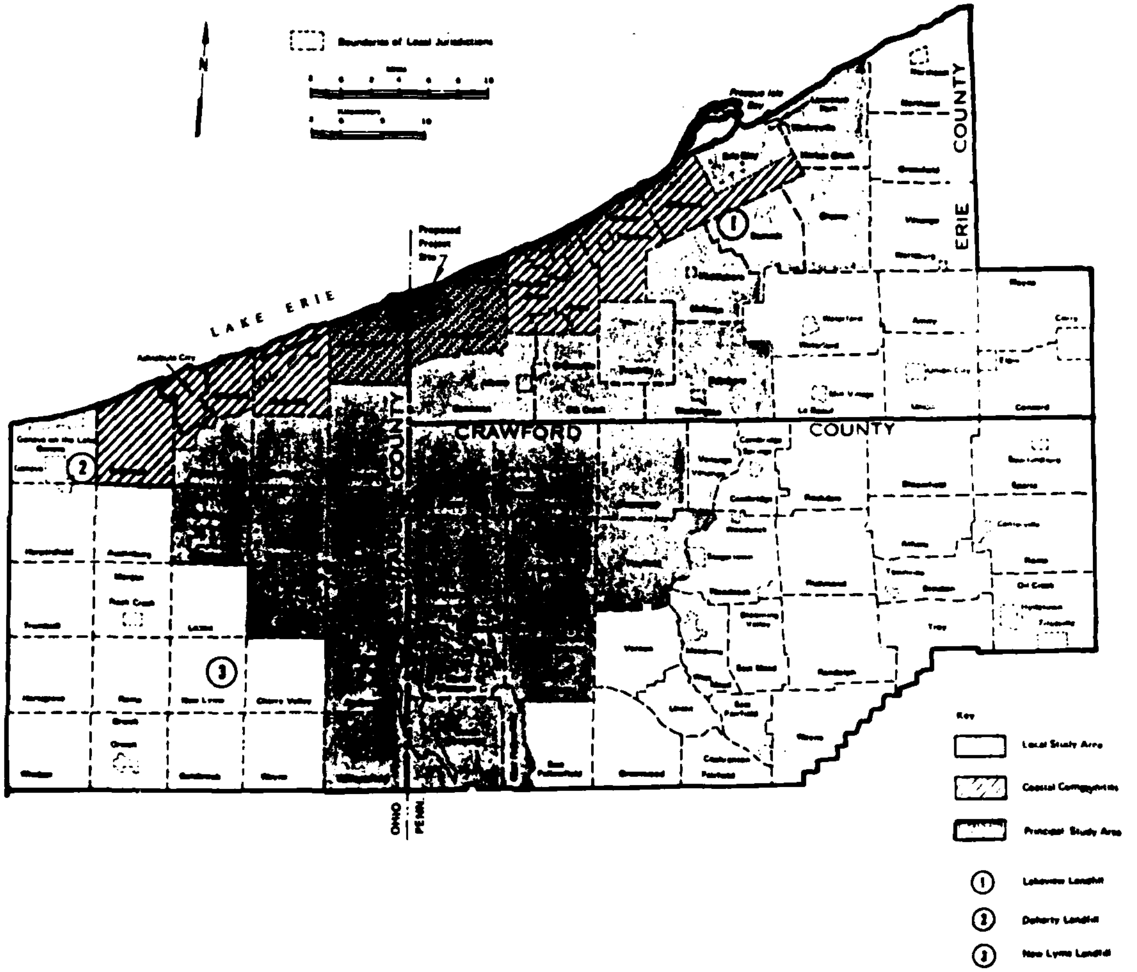


FIGURE 2–27 LANDFILLS IN THE REGIONAL STUDY AREA

past ten years, many disposal sites have been closed, primarily because of failure to meet the operational criteria for a sanitary landfill. In some cases, however, closures were attributed to the leaching of contaminants to groundwater. The New Lyme, Ohio, and Lakeview, Pennsylvania, facilities were formerly open-dumps that have been converted to sanitary landfills. New Lyme has a remaining fill area of about 60 acres and at the current rate of 20 tons per day, the site would have a projected lifetime of over 100 years. Doherty was recently granted a State permit for a new 43-acre landfill close to the present site and at the current rate of disposal of about 60 tons per day, this site would have a lifetime of the order of 27 years. Lakeview is the only facility that collects and treats leachate. The site is underdrained and the leachate is treated in waste stabilization ponds. Lakeview has a projected lifetime of one year at the current disposal rate of 550 tons per day. A permit request has been submitted to expand the facility an additional 139 acres. If granted, the site could operate about 12 more years, at the current disposal rate. If the permit is not granted, and the waste load currently handled was to be accommodated by New Lyme and Doherty, the lifetimes of these sites would decrease significantly. Assuming an equal distribution of wastes between New Lyme and Doherty, the lifetimes would decrease to 10-1/2 years and seven years, respectively. Several incinerators in the study area have been closed because of failure to meet air pollution standards. However, the city of Erie recently constructed an incinerator complex, comprised of two multiple hearth units, to handle municipal sludge from the city and industrial sludge from Hammermill Paper.

c) Administration

2.394
Though the implementation of solid waste management in the Regional Study Area has been relegated primarily to private Contractors, governmental units are responsible for overall administration. State, county, and local municipal offices must plan, develop, and monitor management activities, as well as license and permit private Contractors for operation. For instance, in the Pennsylvania Principal Study Area, many areas are not provided with public services and for a variety of reasons do not use private services. This is of concern to the Erie County Solid Waste Authority in their capacity to assure that solid wastes do not become a menace to public health or safety. In one case, for example, the Authority designated centralized sites for waste disposal, thus circumventing the problem of waste dumping in numerous areas.

d) Equipment and Vehicles

2.395
Waste collectors, operating in the Local Study Area and Coastal Communities, generally use 15- to 20-cubic-yard compactors. The typical 20-cubic-yard, rear end loader compactor vehicle used for collection picks up approximately 10 tons of refuse per paid eight-hour day. In the case of both municipal and private collection, three-member crews are used with these vehicles.

e) Cost of Service

2.396
Financial arrangements for collection service vary from community to community, and as noted before, are dependent upon Contractor-customer agreement. Residents in the Coastal Communities pay from $3 to $15 per month per private collection. Those municipalities directly or partially engaged in collection activities receive payment through income/property taxes. Transfer station charges are $7.18 per ton at the privately-owned transfer station in Erie City, and $8.00 per ton to private haulers using the city operated transfer station in Ashtabula City. Disposal charges are $3.00 per ton at Doherty in Ashtabula County and $4.50 per ton at Lakeview in Erie County. Transfer station charges also include subsequent transport to a disposal site as well as disposal costs. The costs of private collection must cover both waste pickup disposition, either at one of the transfer stations or at one of the permitted landfills. The distribution of costs between collection and transfer or disposal may be estimated from the private collection charges of $3 - $15 per month. If the average household has four persons, then the waste generation rate per household is 1.75 tons per year (based on a project study area residential waste generation rate of 2.4 pounds per capita per day). Collection and disposal costs (paid by residents to private haulers as "collection" costs) therefore range between $20.57 per ton and $102.86 per ton, or between $9 per capita per year and $45 per capita per year. In Ashtabula City, the 1976 and 1977 budget appropriations for solid waste collection, transfer, and disposal were $512,164 ($21.05/cap/yr) and $530,424 ($21.77/cap/yr), respectively. A breakdown of these total costs is presented in Table 2-230.

f) Landfill Facilities -- Capacity/Utilization

2.397
Presently, the landfill capacity in the Regional Study Area is inadequate. Three permitted sanitary landfills serve the entire three-county region and collectively receive a total of 630 tons per day.

Table 2-230

Budget Appropriations for Solid Waste Collection and Disposal in Ashtabula City

	1976	1977
Salary and Wages	$313,713	$286,750
Benefits (Hospitalization Insurance)	14,904	16,000
Retirement	25,322	37,280
Travel	650	450
Utilities	12,000	14,400
Operating Expenses	145,575	175,544
Total	$512,164	$530,424

Source: Office of the Auditor, Ashtabula City, Ohio.

The 1975 Regional Study Area population of 458,600 generated residential waste at an average rate of 2.4 pounds per capita per day, commercial and institutional waste at an average rate of two pounds per capita per day, and industrial waste at an average rate of two pounds per capita per day or a total of 1,468 tons per day. The 837 tons not going to one of the three permitted landfills may be disposed in other counties and States. At the present waste generation rate of 536,000 tons per year the required landfill space is about 29 acres per year. Based on the projected 1990 baseline populations and waste generation rates shown in Table 2-231, the total quantity of waste generated for sanitary landfill disposal in the Regional Study Area in 1990 would be approximately 670,000 tons per year. The required landfill capacity would thus be about 36 acres per year in 1990. Over the period 1979-1990, approximately 402 acres of landfill space will be required, assuming 30-foot fills and wastes compacted to 1,000 pounds per cubic yard. The fill area currently available in the region, assuming that the proposed Lakeview disposal area expansion is permitted, is 242 acres. By 1979, the available area for filling will have been reduced by about 60 acres, thus the shortage in landfill capacity between 1979 and 1990 is projected to be about 220 acres.

g) Planned Addition of Landfill Facilities

2.398
The States of Ohio and Pennsylvania are currently developing plans to investigate solid waste management problems (particularly provision of adequate landfill capacity or alternative disposal methods) and their possible resolutions. To date, several sites in the Regional Study Area have been surveyed and declared hydrogeologically acceptable for solid waste disposal. However, the degree of public opposition to any expansions or new construction is enormous. Both public officials and private landfill operators seem to feel that affirmative permitting and zoning decisions will be politically possible only under conditions of crisis. Therefore, it is not possible to predict where the landfills will be located, how many there will be, or even whether they will all be located within the Regional Study Area. Wastes for disposal currently do cross State and county lines and are likely to continue to do so, despite the fact that transportation costs can be a major factor in the economics of disposal.

Table 2-231

Projected Solid Waste Generation Rates in the Regional Study Area

Location	Waste Generation (lbs/cap/day) 1979	1990	Assumptions
Conneaut	2.4	4.9	Increasing Institutional/ Commercial Wastes
Kingsville	2.4	2.7	Remains Residential
Ashtabula Township	2.4	2.7	Remains Residential
Ashtabula City	6.6	7.3	Similar Residential/ Commercial/Institutional waste mix over the period
Saybrook Township	2.4	2.7	Remains Residential
Rest of Ashtabula County	2.4	2.7	Remains Rural/Residential
Springfield Township	2.5	2.8	Remains Residential
Girard, Lake City and Platea	3.5	3.9	Similar Municipal/Industrial mix over the period
Fairview	2.4	2.7	Similar Municipal/Industrial mix over the period
Millcreek	2.6	2.9	Similar Municipal/Industrial mix over the period
Remainder of Erie and Crawford Counties	7.0	9.2	Dominated by Projected growth in Erie City

Source: Arthur D. Little, Inc. estimates. Information on the methodology used to project waste generation rates can be found in the Solid Waste Working Paper.